THE

CIVIL ENGINEER

AND

ARCHITECT'S

JOURNAL.

FROM OCTOBER, 1837, TO DECEMBER, 1838.

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PREFACE.

We feel happy in reaching the conclusion of our first volume, not from dissatisfaction with the task, but from the conviction that as we have done our duty hitherto, that so we have a similarly useful career guaranteed to us for the future. To the work itself, and to our own exertions we will allude presently; but first, we think, we cannot better introduce this volume than by offering a short abstract of the progress of the two professions in the current year, of which our labours present a register, and in summing up which it will be seen how far we have performed our duty to the public, and fulfilled the pledges under which we commenced this undertaking. This review is, perhaps, the more necessary, as it enables us to ascertain what events belong to this particular epoch, and to compare the present period with its predecessors. That the annals of this year, although many resources have been cut off by financial difficulties, are neither wanting in importance of themselves, nor as relatively to other portions of this century, the great development of steam navigation and railways evidently proves, while they contribute extensively to the character of an age which may justly be marked among the eras of human civilization. Wonders, succeeding wonders, pass before our eyes, and each by its gradation serves but to weaken the impression of its successor, they become as it were in the period of their performance diluted from their strength; and it is only therefore when they become matters of the past, that the eye can take in at one view the whole immensity of the subject, and appreciate its greatness. It is this feeling which induces us to look with pleasure upon the bright epochs of the bygone day, and after classing the events of our own existence with those of the darker periods, we wish that it were our lot to exist in days when poets trod the same ground, and science heralded its greatest triumphs. It is not that we are insensible to the progression of the age, but that like a man growing gradually rich by regular labour, we feel our possessions less in comparison with one who suddenly acquires wealth. It is by such defects of the human mind that in hankering for the glories of the past, and losing the enjoyment of those of the present, we become dull to the emotions of an era, which as it is gradually sweeping away all the labours of former ages, so by these very effects it is surpassing them in grandeur. If we look back to our own golden days, to Pope, Milton, Shakspeare, we find nothing that obscures in importance the present, and it is only by comparing this latter with the European era of the Restoration of the arts, called by us the Reformation, that we are able to appreciate its importance and ascertain its value. That restoration acted powerfully on mind and matter; it recovered the riches of Greece and Rome, and perpetuated that knowledge by the printing press, while on the ocean it armed and guided the adventurous seaman. It aroused the old world from its slumbers, and called into existence the new; it shook to the foundation the knowledge and belief of the multitude, and forced into life new modes of reasoning and of thought. This is a summary which no former secular eras of the world can present, for while this tells of restoration and new life, they relate only the history of ruin and desolation, and the bending of luxury to barbarism and darker ignorance. On our side, if we derive much from the efforts of the past, it is no derogation from our claims to distinction, it is an inheritance and a possession as much as the glories of Greece and Rome, from which the age of the restoration derived lustre, and delegated it to posterity. In the present day the current of the Mississippi and the storms of the Atlantic have been overcome, the speed of the animal creation surpassed, and the resources of the vegetable kingdom supplied from the bowels of the earth—the whole human race knit in closer bonds of connection, nations converted into townsmen, and distant countries into neighbouring provinces, while the prejudices of locality have received a fatal and an unexpected blow. The steam boat flies in a safer path than the ship guided by the compass, and the powers of cannon and gunpowder bid fair to be abolished with the vessels which they armed. The same fluid which spins clothing in England for the majority of the inhabitants of the earth, has given to the printing press an impetus by which all its former properties of communication are lost in the shade of insignificance. The new world which our ancestors gave to us has been brought within a fortnight's journey of our shores, and the preponderance of civilization irrevocably secured. Another world has sprung up in Australia, and Polynesia is forming new nations as it once did islands. Chemistry has advanced into a science, geology has peopled and discovered unknown worlds, and electricity has developed powers which will give fresh resources to the human race. These are triumphs in which our own nation, nay, we ourselves have participated, and which will confer lasting glory on our country and lustre on the age, while the future historian will look back with envy to a period when a new destiny was created for mankind, and in which the performances of ancient times were crumbled to oblivion within the very period of the creation of the new. These things are works of the present century, and most of the last score years, and they are but types and precursors of what within our own lifetime must yet be done. It must be pleasant, therefore, to anticipate the future annalist, and contemplate what we have contributed within our present day. Other departments of art and science can doubtless

furnish their quota to the labours of the age, and although Dickens, Knowles, Bulwer, Talfourd, and Marryat, have sustained the honours of letters, and Chantrey and Wilkie those of art, yet we cannot but think that to the historian and the philosopher the works of our influential professions are neither unworthy of comparison in their merit, nor unimportant to the records of the age. In fulfilling this necessary duty, and in order to present a clearer view of the subject, we shall first consider the material operations, and then advert to the more literary portions of the subject, while we shall, as a matter of courtesy to the elder of the two professions, give the precedence to the works which come under that department.

The labours of architects this year have been extensive, but few great public buildings have been erected on account of those of greater importance being still in progress. Among the Government edifices completed have been the Juvenile Penitentiary in the Isle of Wight, and the Judges' Chambers in Serjeants' Inn; but neither are entitled to any architectural rank. The municipal erections include a Guildhall at Penzance, Market-places at Merthyr Tydvil, Brecon, and Helstone, and the Assize Courts at Devizes. The more prominent charitable institutions are the Royal Berkshire Hospital and that at Plymouth. The chief buildings for purposes of science or public instruction, have been the Polytechnic Institution in Regent-street, a new façade to the Royal Institution, the City of London School, the Derby Athenæum, and the Blind School in the Borough. The commercial edifices have been various, and among them the most worthy of notice are the London and Westminster, and the Manchester and Salford Banks, with the Globe and Legal Assurance Offices. The entrance to the London and Birmingham Railway affords an example worthy of the imitation of the other companies having depôts in London. Some artistical contribution to the grandeur of the metropolis is surely due from those who derive so much profit from it, and at least not to allow their stations to appear mere mercenary booths where they ought to be the greatest ornaments. The ecclesiastical structures have been numerous, but we regret that a mistaken spirit of economy has rendered them anything but additions to the architectural riches of the country. When money is taken from the public some sacrifice is due to the national glory and the public gratification, and we are not actuated by any professional bias in saying that some degree of liberality would afford satisfaction to the people and honour to that Church, to which we are indebted for so many noble monuments. A similar spirit of parsimony, but still more reprehensible, has been exercised with regard to the Union Workhouses, and we regret that in this, as in so many other instances, the Commissioners should give such countenance to the ideas of grinding and oppressive avarice which are too commonly attributed to them; indeed, we should have thought it wiser to have relieved themselves from the stigma of reducing the comforts of the poor, rather than to have aggravated it, by endeavouring to bate down the rewards of intellect, and in architecture and medicine seeking science at the lowest rate of degradation to which the necessities of the professors could compel them to submit. We beg to remind both church builders and poor law guardians, that however desirable it may be to have science cheap, and however much we might wish that gold was as abundant as lead, that talent and gold from their rarity will maintain their price, or leave only a substitute in pinchbeck and ignorance. New cemeteries have been opened in different parts of the country, among which one of the finest is the North London, looking down from the Highgate hills on the modern Babylon. The taste for these establishments and for botanic and zoological gardens is rapidly extending, and their successful progress cannot fail to influence greatly both the physical and mental health of the great mass of the population. Of buildings devoted to pleasure, the finest is the Oxford and Cambridge Club. Among the more striking foreign works have been the Arc de l'Etoile at Paris, and the Arco della Pace at Milan (both works commenced by Napoleon), the Church of Loretto at Paris, Girard College (Philadelphia), and the Hungarian Museum at Pesth. While so many noble works have increased the treasures of art, we have to lament on the other hand the loss of several older monuments, although this regret is diminished by the preparations going on for supplying their loss by finer edifices. The destruction of those by fire in the last winter seems to have been caused by accidents arising from the rigour of the weather; and among them were the Royal Exchange in London, the Winter Palace at St. Petersburgh, the Opera at Paris, the Church of Hoorn, and the New York Bowery Theatre. Considerable attention has been bestowed on the restoration of old works, judicious repairs having been executed at Bristol, Christ Church, Winchester, and most of the ecclesiastical edifices in the country, while the use of Saxon in the churches at Tunbridge Wells and Cardiff will, we hope, restore to notice this long-neglected style, so rich in historical associations. Coincident with the revival of this style is the introduction of that of the Renaissance from France, on which we seem to be dependent for internal decoration. We have recently borrowed the tinsel of Louis Quatorze, and because the French have at last awakened to a knowledge of the Gothic, we are now to be overwhelmed with the frippery of the Renaissance. The trumpet has already been sounded, and it will follow as a matter of course, that in the rage of passion the English florid style will be debased below its French contemporary. We regret this imitation of bad masters which pervades our aristocracy, and we can only attribute it to the feeling which illumines with a halo a pilgrimage to the tomb of Virgil or the residence of Voltaire, and makes us forget that in our own metropolis, Milton, a greater man, was born and sepultured. If Gothic must be had, and at such a period, the banquetting halls of Henry the Eighth or of Wolsey will furnish quite as good materials as those of Louis the Twelfth or Francis the First. We suppose that the result of this mania will be to change the style of fresco painting, upon which many of our artists have been engaged this year, and perhaps to supplant the Arabesques of Pompeii for those of Giulio Romano. As the Bavarians have employed fresco abundantly in the interior of their edifices, so this year, under the name of Lithochromy, they have restored the Egyptian and Greek mode of colouring the exterior. The Jews have recently taken a more prominent position with regard to the arts, and the beauty of many of the decorations in the New Synagogue, in Great St. Helen's, affords a good practical commentary on the puritanical aversion to ornament of many of our clergy. A novelty this year has been the erection of a colossal statue to the Duke of Sutherland, in Scotland, emulating the works of Egypt, while we perceive with pleasure that at Edinburgh they have adopted the union of an architectural design with that of a statue to commemorate Sir Walter Scott: and we sincerely trust, that in the plan for a testimonial to the immortal memory of Nelson, the community of the arts will not be forgotten.

Having thus dismissed the subject of Architecture we shall commence that of Civil Engineering, by examining the proceedings of Government on the subject. We shall first refer to the standing orders of Parliament on Public Works, from which, we regret to state, the evil effects anticipated by practical men have fully resulted; and, indeed, it could not be otherwise, when some few ignorant theorists affected the vitality of commercial enterprise, by attempting to destroy a minor evil. The consequence of these regulations has been, that no great work has been offered for public sanction this year, and many have been delayed or abandoned from the absolute impossibility of complying with the absurd restrictions on the means of raising the capital. In addition to these unfortunate proceedings, an equally uncalled for impediment has been opposed to public enterprise in Ireland, by the recommendations of the Government Irish Railway Commission, which appears to have equally attacked the Government and the Public; for as the latter were discouraged by its misrepresentations, so the standing orders of the former were pointed out as incompatible with all sound reasoning and practical operation. In France, on the other hand, the people have gained by defeating the Government in the attempt to obtain a monopoly of the Railways, and have thus probably laid the foundation for the successful operation of the joint-stock system in France, a system which, in this country and the United States, has effected works and created resources, before which those of any country are insignificant. Among other pieces of jobbing contemplated at the expense of the public works of this country, is a pernicious piece of quackery in the shape of appointing inspectors of steam-boat engines, as if they were more worthy of surveillance than other classes of shipping, when the result of such interference must be to place this great arm of the country at the mercy of Government theorists and police chicanery. Too many recent instances have occurred in this country of the evil effect of Government interference, direct or indirect, and we have little doubt that the authorities would interdict any obnoxious invention with the same spirit in which they deprived Southey and Byron of their copyright, and branded the greatest of our modern poets as atheists. We regret to see that the authorities at Washington, with their characteristic disposition for meddling wherever they have an opening, have managed to obtain a similar control in the United States, and with about as much reason. It is well that the laws should be made stringent for criminal neglect—for that every man knows his responsibility; but it never succeeds to subject a mass of men to the ideas and opinions of a few; but on the contrary annihilates all emulation, and promotes a spirit of servility and degradation. The Ordnance and Tithe Surveys have been carried on with greater vigour; but we cannot but regret that a truer spirit of economy had prevailed, and a greater regard to the early completion of works so important to engineering. A geological survey ought to have been carried on simultaneously, and the surveys for Boundaries and Tithes united, by which large sums would have been saved and the objects better attained. The delay has been caused, according to the opinion of some, by the want of a greater number of officers; but we must observe that there would have been no difficulty in obtaining a competent supply of civilians, as is done in other countries. The Act passed to regulate the Conveyance of Mails on Railways, although rather premature, has been made less injurious in its enactments than was originally proposed; but we earnestly wish that the Administration, when they endeavour to obtain so many sacrifices, avowedly on account of the public, would take more effective measures to render that department useful to the public, as it now presents great obstacles to the diffusion of science and the interests of trade. We regret, that although some discussion has taken place on Copyright, and amended laws have been made to protect mental property, that no improvement has taken place in the law of Patents, but that it still remains more barbarous and ineffective than that of any nation of Europe, and is infinitely surpassed by the legislation even of the Spaniards. We take great pleasure in instancing, as an act of liberality, the grant, by the American Congress, of 100,000 dollars to the heirs of Fulton, while, in our country, the only honours bestowed upon the profession have been statues to Watt, at Greenock and at Manchester.

In the enumeration of the works completed this year, the subject of Railways will necessarily claim priority, and particularly as exhibiting one of the most important features; for although we have already had sufficient of these works to appreciate their merit, it is only at present that we begin to enjoy anything like extensive advantages from them. The road is now completed, by the Birmingham, Grand Junction, and North Union Railways, to Preston; and while the Southampton, Great Western, and Hayle Lines have been partially opened, those of the Newcastle and Carlisle, London and Greenwich, Manchester and Bolton, Newtile and Glammis, and Dundee and Arbroath, have been completed. The American Railways have been very much impeded by the financial difficulties of that people; but in other extra-insular countries great progress has been made. The Belgian Railways have been extended, and lines have been opened from Paris to St. Germain, from Dresden to Leipsic, from Vienna northwards, from Berlin to Potsdam, and at Havannah, in the Isle of Cuba. We regret that their operations have been accompanied with many serious accidents; but it is to be observed that, while they are not more severe nor more numerous than those incident to other methods of travelling, they are such as, being attributable to newly organized undertakings, will be diminished with the steady progress of this means of communication.

With regard to Canals—having attained their greatest development, they must necessarily remain stationary, and present us with few remarks. A Grand Tunnel, however, has been opened on the Birmingham Canal at Cozely, near Bilston, and the Ulster Canal in Ireland, and the Laonine in Canada, have been opened for traffic.

Many Bridges have been finished in different parts of the country: but, except that at Sockburn over the Tees, none of any extent. Several Steam Floating Bridges have been erected in the South of England, and are found to present a cheap means of communication. Repairs to some extent have been made of the bridges over the Thames, and the Brighton Chain-pier; and accidents have occurred to several Suspension Bridges at home and abroad, from weather, and during the course of trial, among the latter of which is that at Freyburg.

Several Harbours are in progress or contemplation, but little of importance has been done this year. A long Sea-wall has been constructed at Hastings, and a River-quay at Woolwich, and several minor works in different sea ports.

A prominent feature of the year is, undoubtedly, the extension of Steam Navigation, and the successful result of the passage to America. This line of traffic is now placed on a firm basis, and its effects on the intercourse of the two kindred countries must speedily become of the utmost interest and importance. Independently of the general increase of this

means of navigation, a direct communication has been established between London and St. Petersburgh, with Madeira, and with our possessions in the East: it has been extended in Portugal and the Brazils, and to the rivers Meuse and Nile. In the construction of the vessels a similar impulse has taken place. Steamers of a large class, as the Great Western, British Queen, and Liverpool, have enhanced the importance of our mercantile marine, while a considerable increase has been made in the employment of iron steamers at sea and on the rivers. Steam Naval Architecture has been elevated into a regular art, by the labours of the engineers and the works of its authors, while important experiments have been made to effect its improvement. The Columbus Quicksilver Steam boat for some time attracted public attention, but nothing of importance has yet been done, and in the meanwhile the Archimedean is carrying out the result of a series of theories and experiments, commenced by Trevithick, to obtain motion by placing the propelling power at the stern of the vessel. Steam ships of war have acquired fresh importance, and the different Governments of the world have directed their energies towards the improvement of this arm of warfare, of which the success of the English in Portugal and at St. Sebastian's have shown the importance. These vessels have been armed in a more formidable manner, and the Government has regularly adopted them into its service, by giving their engineers relative rank with the several classes of warrant officers of the old navy. We should suggest, in addition, that mechanics form a regular part of the instruction by the newly introduced naval instructors; and that an examination on this subject be added to the qualifications for passing as a lieutenant. Among the incidents of the increase of steam traffic have been several dangerous explosions of vessels, respecting which the public mind has been unnecessarily agitated. We believe that these occurrences are less attributable to any faults of the parties concerned, than to the infant state of the science, which does not allow that accuracy which is consequent on a longer experience. Thus, for instance, it is known that locomotive engines from the same maker will vary to a great degree in their performances, beyond the exertions of any precaution or skill to ensure uniformity; and, indeed, it appears hard to require perfection in such enlarged machines, when even in the little watches which we daily observe we cannot check irregularities. At any rate, from the examination of men of the greatest experience, it appears impossible by any superintendence to effect that which can only be the result of the advancement of science.

Mining has presented several novel features, of which the more remarkable have been the utilization of anthracite coal, the application of the hot blast, and the introduction of asphalte. Little more as yet has been done with regard to the employment of this latter, than laying down some experimental pavements, which appear to have worn well hitherto. As an aid to the progress of mining, we may instance the extension of schools for instruction in that branch, to which we shall have farther occasion to allude in a subsequent part of this review.

Having dismissed these portions of the subject we will now proceed to ascertain what has been the progress of the professions in contributing to and maintaining the stores of knowledge left by our predecessors. We find among the books published many that do honour to the public spirit of their publishers, and which will stand in honourable rivalry with any of their predecessors; but we perceive on this as on previous occasions a paucity of volumes on the subject of Architecture. In our pages will be found Reviews of Tredgold on the Steam Engine and Naval Architecture; the Public Works of Great Britain, by F. W. Simms; the Port of London, by James Elmes; N. Wood, on Railways; the Transactions of the Institution of Civil Engineers; Papers, by the Corps of Military Engineers; several Works on American Engineering; Railway Practice, by S. C. Brees; Britton's Dictionary of the Ancient Architecture of Great Britain; and Dr. Ure's Dictionary of Arts, Manufactures, and Mines. A new class of literature has been created by the extension of Railways, directed to topographical descriptions of the country through which they pass, and it is most probable that the number of these works both here and abroad will extend the limits of topographical knowledge.

The several societies devoted to the promotion of professional objects have continued their useful careers, and greatly contributed to the accumulation of practical knowledge. To the proceedings of the Institution of Civil Engineers we have had occasion to allude, and numerous communications have been addressed to the Royal Institution of British Architects, the Architectural Society, and that at Manchester. The Mechanical Section of the British Association bestowed their usual attention on Engineering objects, although we should be better gratified by seeing their proceedings attain a character of more practical importance. The Royal Academy, being principally devoted to the imitative arts, have never been able to afford those facilities to Architecture which it imperatively demands; but the small space which they are enabled to reserve for an exhibition on this subject has been fully occupied by the zeal of the rising architects. Among the events important to the Arts is that of the great extension of the Museums this year, although we cannot refrain from pointing out the unnecessary seclusion of the Soanean Collection, the principal Architectural Gallery of the country. The East India Museum has disclosed some interesting representations of Oriental edifices, and the Hampton Court Gallery allows the public access to greater treasures of art than were ever before offered to their contemplations. A new Subscription Mechanical Museum, on the plan of the Royal Gallery of Science, has been opened at the Polytechnic Institution, and affords by its proceedings a new proof of the rising predilection for practical science. We should like, while mentioning the subject of institutions, to suggest that, as we have already a Museum of Antiquities, and a Gallery of Pictures, that the Soanean Collection could not be more appropriately dedicated than as a repository for models of architectural works, many of which are already exhibited there, and there are others of interest dispersed in various parts of the metropolis. Nothing, for instance, could be more pleasing than to trace the progress of St. Paul's from Wren's first sketch to the finished building, and we are sure that to such an object the profession and its institutions would contribute with pleasure. In this manner, in the Bodleian Gallery, at Oxford, the middle of the rooms is occupied with models of the finest remains of Greek and Roman edifices, arranged so as to become objects of prominent interest.

The progress of professional education has received a sudden impulse, and is placed on a basis, which equally tends to augment its real value, and its estimation in public opinion. The University of Durham has been the first to include among its faculties courses of Civil Engineering and Mining, and this example has been pursued in London by University and King's Colleges. The establishment of a School of Mining at Durham, and the intended foundation

of another in Cornwall, will tend to remove those difficulties which stood in the way of any attempt to form a central School for the whole country, and the nation will be relieved from the reproach—if, indeed, our mining rank does not relieve us from such an imputation—of being neglectful of instruction in this branch of industry. The Irish Railway Report shows in what manner the Agricultural School at Templemoyle has acted as a School for surveying in Ireland, while at Dublin the Royal Society have long maintained a School of Agriculture and Mining. Elementary Instruction in Art has also acquired an unexpected importance, and the Schools of the Society for Promoting Practical Design, and those at Manchester and Newcastle have fully shown the practicability of imparting instruction in design to the artisan, and his anxiety to acquire it. While, however, education has attained this development, we must entreat its promoters to be cautious not to give too great scope to the theoretical, nor to neglect those practical modes of instruction by which we have attained so much eminence, and by which we shall most consult the genius of our people. The system of teaching by lectures, it has been found by experience, cannot successfully inculcate everything; and while it has been abandoned at our older universities, in medical studies it is accompanied by demonstrations and clinical instructions, such as can never be applicable to mines or engineering. We can have no dead railways to dissect, nor prepared veins and lodes to illustrate, and although construction may be partially learned from models, yet it is in the open field of practice that its application must be acquired. While we recognise with pleasure this tribute to science, and this improvement on university education, there is one point we should suggest, which, as it interests the public and not the profession, we are the more prompt to consider worthy of attention in the present propitious crisis,—it is the adoption of that system of instruction in artistical antiquities which is equally recommended by our classical sympathies, and by the opinions of some of our most talented writers. At the same time we should recommend that, as the universities have adopted a new faculty, so they should not leave it the only one without honours; but that, as Literature, Medicine—nay, Music—have their degrees, that here, as in foreign universities, philosophy may equally have its doctorate, and science not remain the only muse untitled and unused.

Having thus, at some length, given a review of the leading transactions of the year, or, if we may so term it, a report on the annals which have been confided to our keeping, we feel less diffidence in alluding to the manner in which we have fulfilled our duty towards our supporters of the two professions. We set out with the determination to be, as far as in our power lay, impartial towards all; and we trust that as we have not been subservient towards any faction, so, on the other hand, we have never unwarrantably attempted to suppress the opinions of others. The author, under the excitement of affection for his work, may sometimes have thought our criticism too severe; but we feel justified that while we have not pandered to the evil feelings of the crowd, the continued support of the public has confirmed us in the views we have taken. While we have constantly endeavoured to repress whatever we thought unworthy of the public notice, we have with the same feeling earnestly endeavoured to elevate the standard of professional excellence, and to protect the character and interests of the professions from the attacks of ignorant prejudice, or the assumptions of foreign rivalry. In communicating information it has been our particular care to limit ourselves to the practical, and to incur the complaint of dryness from the profession, rather than that of ministering to theorists or amateurs. On the other hand, we trust that the immense mass of matter condensed into close compass is free from the reproach of dullness, or of neglect of the higher mental branches, which are the distinction of professions connected with genius and the liberal arts. As we have omitted no means, either by compilation, translation, or by original contribution, to afford satisfaction to our readers, so we feel confident that the quantity of information laid before them will fully assert our disposition to do our duty. In the volume which we now close are above four hundred pages and two hundred engravings, presenting a mass equal to nearly two thousand magazine pages, or eight volumes of octavo novels, and containing a quantity of periodical information not heretofore presented to the two professions. That our labours have been appreciated, the increasing support of our readers has shown, while the attention which we have received from our English cotemporaries and from foreign editors, has afforded a sufficient testimony of our own standing, and of the manner in which we have performed our duties toward the public at large.

We trust that our exertions have been received with that satisfaction which it has been our honest endeavour to afford; and as we are conscious of no dereliction of duty, so we are unaware of any reproach. As it has been our fixed principle to adapt our work to the wishes of our readers, and not to warp it to private purposes, we have been particularly cautious in acceding to any change which we believe was uncalled for by circumstances, or dissatisfactory to our supporters: it is for this reason that although repeatedly importuned, we have steadily resisted any suggestion for increasing the expense of the Journal. It has been observed to us, however, that in the present deficiency of architectural periodicals, it would be productive of great convenience to the profession if we were to devote a larger space to the communication of such information than our present limits permit us to afford. Under such circumstances, should it appear to meet with the general concurrence of our readers, we would publish quarterly, at sixpence, an additional sheet, or an engraving of a public building. For ourselves, however, we candidly admit that we are perfectly satisfied with our present progress, and shall only, in compliance with such disposition for a change, take measures to increase the amount of our labours.

To our numerous contributors the prompt attention we have on all occasions shown will be a sufficient proof of our recognition of their services; but we cannot conclude this volume without especially thanking them for the essential advantages which their talents and abilities have, on many occasions, afforded to the Journal, and at the same time assuring them that we shall always derive gratification from a continuance of their support. To the professions at large we generally appeal to afford us information on whatever comes under their notice; and to the architects in particular we rely for contributions on the extension of the Journal, for as it will be mainly devoted to their objects, so it will be incontestably entitled to their support.

In conclusion, we place before our readers the result of our labours, and trust that, as we have endeavoured to merit their patronage, that so our exertions may for many future years entitle us to its continuance.

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THE

CIVIL ENGINEER AND ARCHITECT'S

JOURNAL.

AMERICAN RAILWAYS.

The construction of railways in this country being the all-absorbing subject of the day, and various plans having been lately introduced for laying the rails on continuous sleepers, we determined at the outset of our work to introduce the several systems of construction adopted in America; for which we are indebted to a work lately published in Paris, and edited by Gme. Tell Poussin. We have had the whole of this work translated, and had intended to go more fully into the subject; but the press of other matter prevented us giving more than that portion which relates to the construction of railways, and which we consider to be of the greatest value. The work enters into a full description of the whole of the American Railways, describing the country, engines, companies, expenses, administration, and legislative documents, some of which we shall hereafter allude to.

The whole of the rails are placed 4 ft. $8\frac{1}{2}$ in. apart throughout the following figures:—

Fig. 1 is a section of the railway adopted on the Boston and Providence line.

Fig. 1.

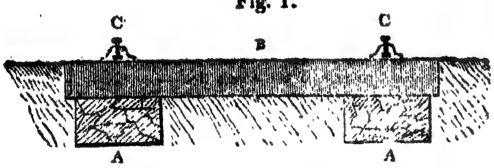


Fig. 2.

Parallel holes A are excavated at intervals of 4 feet from centre to centre, 1 foot 6 inches square, and filled in with broken stone 1 foot deep; upon which are laid transverse timber sleepers B, 6 feet 6 inches long, and 8 inches square. The rails, fig. 2, are of wrought-iron, weighing 60 lbs. per yard, similar to the English rails, fixed in cast-iron chairs, as shown in fig. 3, weighing ten pounds, and spiked down to the sleepers.

Fig. 3.

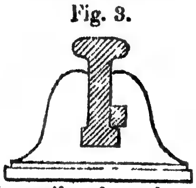


Fig. 4 is a section showing the mode of laying the rails adopted on the Jamaica and Brooklyn line, in Long Island. Instead of transverse bearers, or longitudinal sleepers, vertical pieces of timber A of acacia, larch, white oak, pine, or chestnut, about 12 inches diameter and 3 feet in length, are let into the ground the whole depth, with the largest end downward; the soil is then puddled round them, and they are sawn off level with the under side of the rails. They are placed 3 feet apart from centre to centre; every other pair are connected by a light iron bar, B, let in level with the top, and attached by cramps; the surface of the blocks is coated with hot tar or pitch; the rails are fixed immediately on the top of the blocks. This mode of construction is very economical, and calculated to last fifteen years before any of the blocks require replacing.—[It would be far better if the vertical pieces were fixed with the smaller end downward, they would then act like a wedge.—*Editor.*]

Fig. 4.

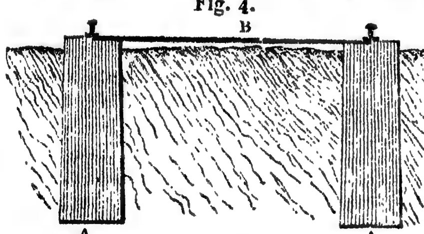
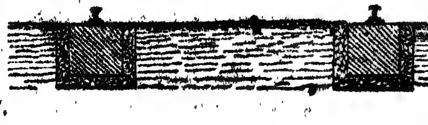


Fig. 5 is a section of the railway from Amboy to Camden, in the State of New Jersey. They have adopted the English system, by using stone sleepers, 2 feet square, and 10 inches deep, which are bedded in a mass of concrete or broken stone, 4 feet apart from centre to centre. The rails are of wrought-iron, in 16 feet lengths; a section is shown in fig. 6; width of top $2\frac{1}{4}$ inches, base $3\frac{1}{2}$ inches, narrowest part $\frac{1}{2}$ inch, and height $3\frac{1}{2}$ inches; weight, 40 lbs. per yard. The rails are fixed without chairs, resting upon the stone sleeper, and fastened down with strong cast-iron pins let into the stone between two wedges of wood. A thin piece of wood is placed between the rail and the sleeper, to break the direct concussion of the locomotive engine.

Fig. 5.



No. 1.—October, 1837.

Fig. 6.

Fig. 7 is a section of the railway from New York to Paterson, across marshy or swampy land. Holes A are dug in two parallel lines, 3 feet apart from centre to centre, 1 foot 6 inches square, and 2 feet 6 inches to three feet deep, filled in with broken stones, such as are used for M'Adamized roads. Upon these are laid transverse bearers B, of cedar or acacia wood, 8 inches square and seven feet long, on which are fixed longitudinal plates C, 6 inches by 8, bearing on the top of their inner edge rails of wrought-iron flat bar, $2\frac{1}{4}$ wide and $\frac{1}{2}$ inch thick, weighing 12·60 lb. per yard.

Fig. 7.

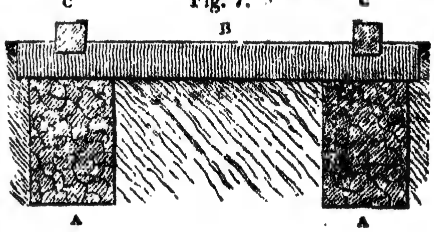
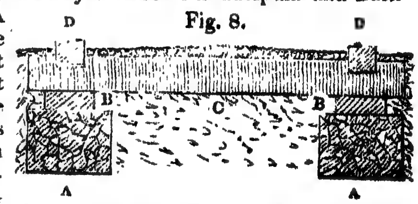


Fig. 8 is a section of the railway between Philadelphia and Baltimore. Parallel trenches A are excavated the whole length of the railway, 1 foot 6 inches wide, and 1 foot 2 inches deep; they are filled up with broken flints well rammed down, upon which are bedded the sleepers B, 10 inches wide and 4 inches thick, of spruce or other timber; on these are laid transverse bearers C, 6 feet 6 inches long, and 8 inches square, placed 3 feet apart from centre to centre, and fastened to the sleepers by keys. On the top are caulked down longitudinal plates D of oak, 6 inches square; on the edge of which is a flat wrought-iron rail, $2\frac{1}{2}$ inches wide, $\frac{5}{8}$ of an inch thick, and in lengths of 15 feet, weighing 15·75 lb. per yard: each rail is fastened by 12 nails.

Fig. 8.



On a portion of the line they have adopted a different construction, as shown in fig. 9. Stone sleepers A, 1 ft. 6 in. by 1 ft., and 1 ft. high, are bedded in gravel or sand sunk in a hole, 2 ft. by 1 ft. 6 in., and 1 ft. 4 in. deep, at intervals of 3 ft. from centre to centre; and on the sleepers are laid the plates B, 6 in. square, secured by cast-iron chairs, spiked down: the rail is similar to that in last figure.

Fig. 9.

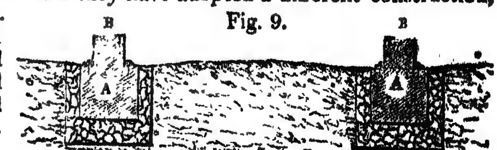


Fig. 10 is a section of the railway from Portsmouth to Roanoke, adapted to alluvial soils. Transverse sleepers A of oak, 8 ft. long, 8 in. wide, and 1 ft. deep, are buried in the ground, 5 ft. apart from centre to centre, on which are caulked down the longitudinal plates B of yellow pine, 5 in. wide and 9 in. deep; on the edge are laid flat wrought-iron rails, $\frac{1}{2}$ an in. thick and 2 in. wide, weighing 10 lbs. per yard. The transverse sleepers are hollowed in the centre, so as to allow a gravel road on the top for the use of horses.

Fig. 10.

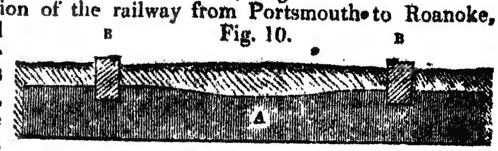


Fig. 11 is a plan, showing one of the lines of the railway from Baltimore to Washington.

Fig. 12 is a transverse section; and Fig. 13 a side view.

Fig. 11.

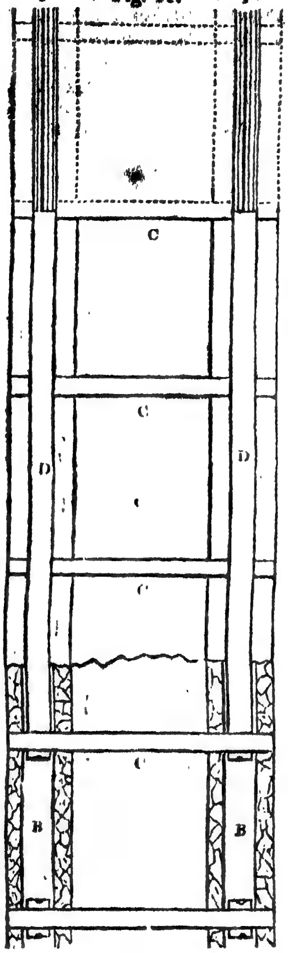
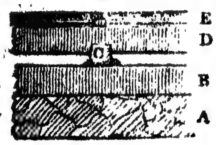


Fig. 12.

Fig. 13.



Parallel trenches A are cut the whole length of the line, 1 ft. 6 in. wide; these are filled in to the depth of 8 in. with broken stones, forming a foundation for the longitudinal timber sleepers B, 6 by 7, upon which are laid transverse bearers C, 7 ft. long, 4½ square, at intervals of 4 ft. from centre to centre; on the top are caulked down longitudinal plates D of timber, 6 in. square, upon which are fixed wrought-iron rails F in 15 ft. lengths, 3½ in. wide at base, and only 2 in. high, just sufficient to clear the wheels of the carriages: the rails weigh 30 lbs. per yard.

Fig. 14 is the plan of a double line of railway from Lowell, in the State of Massachusetts. The width of the railway for the two lines in the cuttings is 30 ft., and where it is constructed on a scaffolding, 23 ft. 6. in.; the space between the rails in the centre is 6 ft.

Fig. 14

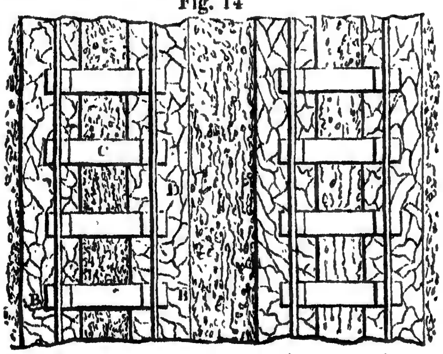


Fig. 15 is an enlarged section of one of the lines. Parallel trenches A are excavated, 2 ft. 6 in. wide, and varying in depth from 2 ft. 6in. to 3 ft.; they are filled in with broken stone, and on the top are bedded granite sleepers B, 1 foot cube each, and 3 ft. apart; guide pieces C of timber, 8 ft. long, 1 ft. wide, and 6 in. high, are placed transversely between the granite sleepers. The rails D are of wrought-iron, similar to the Liverpool and Manchester rail, weighing 40 lbs. per yard; they are in 12, 15, and eighteen feet lengths, and fixed with iron keys in cast-iron chairs, weighing 16 lbs. each.

Fig. 15.

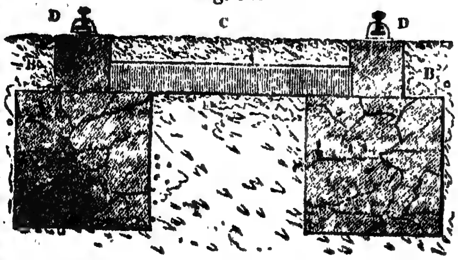


Fig. 16 is a section of the railway from Schenectady to Saratoga, in the State of New York. Parallel trenches are cut 1 ft. 6 in. wide, and filled in with broken stone 1 ft. 6 in. deep, upon which are laid longitudinal timber sleepers B, 5 by 8, with transverse bearers or ties C, 6 by 6, placed 3 ft. apart from centre to centre: on the top are caulked down continuous plates D of timber 6 in. square, with a wrought-iron rail or list on the inner edge, ½ in. thick and 2½ wide, weighing 12·60 lbs. per yard; the ends of the rails are jointed or halved one into the other; the stone sleepers and timber are bedded in broken stones and earth.

Fig. 16.

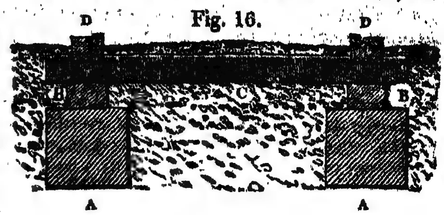


Fig. 17 is a section of the Columbian railway: parallel trenches A are cut 2 ft. 6 in. wide, and 1 ft. 8 in. deep below the surface of the ground, and filled in with broken stone, in which are bedded granite sleepers B, 1 ft. 8 in. square and 1 ft. thick, placed 3 and 4 ft. apart, and connected by transverse iron bars C. The rails D are drawn to a larger scale in fig. 18, 2 in. wide on the top, 3½ deep, and weighing 40 lbs. per yard; they are fixed in cast-iron chairs, weighing 13 lbs., with 2 wrought-iron wedges or keys, weighing 9 oz.: the chairs are fixed to the stone blocks with two wrought-iron pins, weighing 9 oz. each, and 5½ in. long.

Fig. 17.

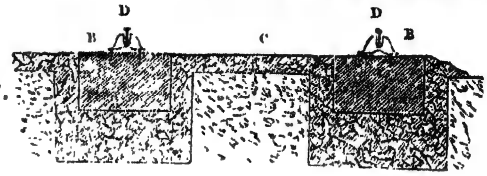


Fig. 18.

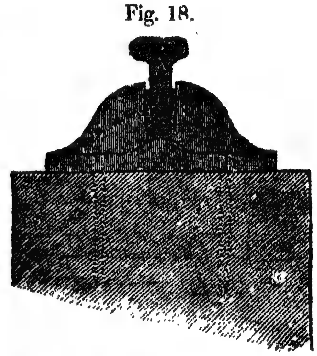
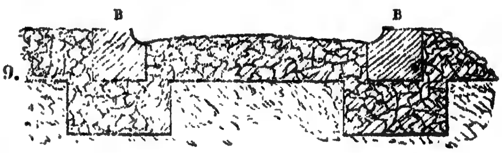


Fig. 19 is a section of the railway adopted on part of the same line.

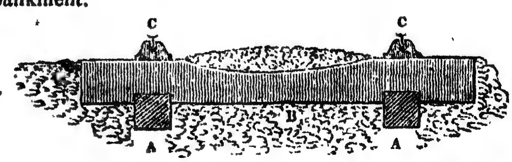
Fig. 19.



Parallel trenches A, are excavated, 1 ft. 10 in. wide, and 1 ft. deep below the surface of the ground, and filled in with broken stones, upon which are bedded continuous stone blocks B, 1 ft. square, hollowed on the edge to allow the working of the wheels; the surface of the road is covered with broken stones.

Fig. 20 is a section of another portion of the railway constructed on an embankment.

Fig. 20.



Longitudinal sleepers A, of timber 8 in. square, are bedded in the earth, on which are notched down transverse bearers B, 7 ft. long, and 9 in. high, hollowed out in the centre for the roadway, upon which are placed the rails and chairs C, similar to those in fig. 18. As soon as the embankments are consolidated, stone sleepers are to be substituted for the timber.

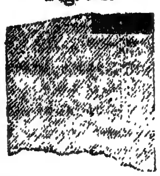
Fig. 21 is a section of the railway from Philipsburgh to Juniata.

Fig. 21.

Parallel trenches are cut and filled in with broken flints, upon which

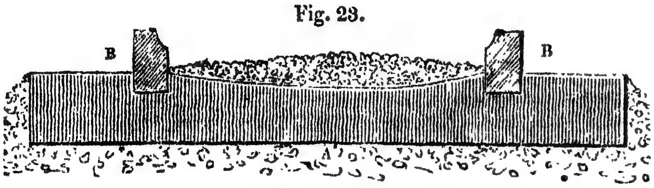
are bedded trees A of white oak, 30 inches diameter, with the under side squared equal to 9 inches in width; on the top are laid transverse bearers or ties B, 8 feet long, 9 inches high, and 5 inches wide, placed 4 feet apart; on the top are caulked down the plates C, of white oak or heart of pine, 9 by 5; the rails, fig. 22, are of wrought-iron bar, 2 inches wide, and half inch thick, weighing 10 lbs. per yard; they are fastened by 5 inch spikes; under the ends of the rails are placed pieces of plate-iron 4 inches square, and a crevice is left to allow the water to pass off the road.

Fig. 22.



For the railway from Charleston to Augusta, they have adopted different modes of construction. Fig. 23 is a section of the railway on clay and gravelly soil; transverse sleepers A, 9 feet long, 10 inches

Fig. 23.



thick, and 1 foot high, are laid 6 ft. 6 in. apart from centre to centre, upon which are caulked down plates B, 6 by 9.

Fig. 24 is a section of the railway on embankments: longitudinal sleepers A, 9 inches square, are laid parallel and continuous, upon which transverse bearers and plates are laid like those in the last figure.

Fig. 24.

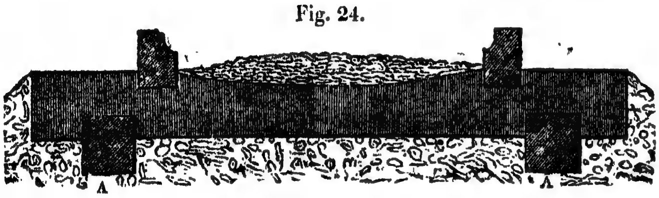
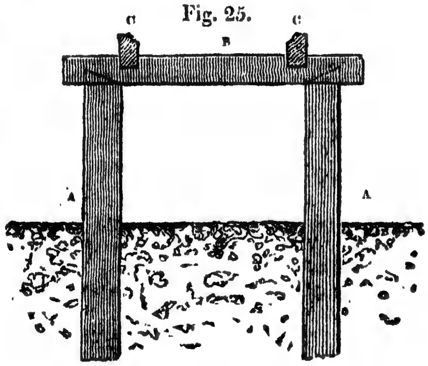


Fig 25 is a third mode of construction, adopted on marshy soils: a scaffolding of timber is constructed with piles A, from 10 to 15 inches diameter, driven into the ground at intervals of 6 feet 6 inches longitudinally, and 6 feet apart transversely: in some soils that offer little resistance, the piles are driven to the depth of 25 feet by a ram, weighing from $5\frac{1}{2}$ to 9 cwt., from a determined height, depending on the resistance of the ground; the driving is continued until the last blow or fall of the ram, from a height of 20 feet, drives the pile less than 2 inches at each fall; in general, holes are made in the ground 3 feet 6 inches deep for the piles before they commence driving: the piles are not pointed, consequently they offer greater resistance, and insure greater stability; after they are properly fixed, they are cut off to a level, and on the top are framed transverse bearers B, 9 feet long, and 9 inches square, upon which are laid the plates C as before.

Fig. 25.



Figs. 26 and 27 are sections of the plates and rails: the plates are 6 by 10, and never less than 20 feet long; the edge of the plate is hollowed nearly an inch in depth, to allow for the play of the wheels, and the iron rail projects a trifle over the edge. The rails, fig. 26, are $2\frac{1}{2}$ wide and one inch thick on the inner edge, and $\frac{3}{4}$ of an inch on the back edge. The rails are not fixed until the surface of the plates is made perfectly uniform, so as not to

Fig. 26.

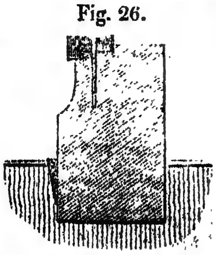
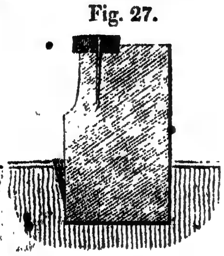


Fig. 27.



admit the slightest play on the rails. In some situations, where the height of the scaffolding was 15 feet above the ground, they had recourse to struts or braces D, fig. 28, projecting at the base 8 feet, and secured at the foot by stakes E. If the height did not exceed 7 to 10 feet above the natural soil, the struts were not used, but a brace 4 by 5 was introduced between the piles, as D, fig. 29. If the height was above 10 feet from the natural soil, two cross braces were introduced, as D, fig. 30.

Fig. 28.

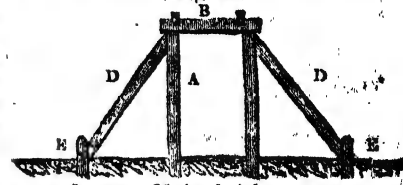


Fig. 29.

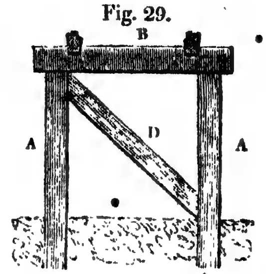
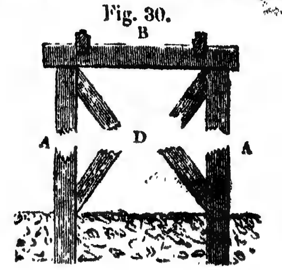
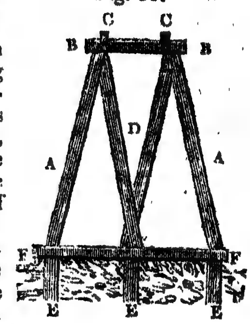


Fig. 30.



And if the soil was not firm, and the railway was 12 feet high above the ground, a stage was erected with three vertical pieces of timber, as E, fig. 31, connected at the top and bottom by a cross tie F of timber, one foot square, the whole imbedded in an embankment formed of the soil well mixed with sand: on the top of this stage is erected a scaffolding 18 feet high, the shape of the letter W reversed, with timber supports A, and braces D, 10 by 8, framed into the bottom tie F, and connected at the top by the transverse bearer B, 6 feet long, 12 by 10, on which are laid the plates C and rails. This method of construction has succeeded very well.

Fig. 31.



When the elevation is from 18 to 20 feet above the natural soil, pillars or piles are planted, connected at the top by a cross tie one foot square, upon which is erected a scaffolding at intervals of 10 feet, similar to that just described.

REVIEWS.

A Practical Treatise on Calcareous Mortars and Cements. By L. T. VICAT. *Translated, with Additions, by* Captain J. T. SMITH, *Madras Engineers, F.R.S., &c.* London; John Weale, 1837.

THERE are very few works connected with building that enter into a geological, chemical, and practical description of materials, although so very essential to a proper understanding of the qualities of the component parts: to enable us to judge of their applicability to the purposes intended, it would be highly beneficial to the profession if the Institute of Civil Engineers or Architects would offer prizes of adequate remuneration to induce professors of the first ability to write one or more essays on geology and chemistry connected with building materials.

The work before us partakes of the above requisites: the original text is well known to many of the profession as being a most valuable work, but there has been a difficulty in understanding many parts, in consequence of the local and technical terms made use of by the author. The translator appears to have combated with these difficulties, and made himself completely master of them; he has very ably done his duty, not only in the translation, but also in his valuable additions. The work commences with a mineralogical description of the various limestones:—

Calcareous minerals are substances essentially composed of lime and carbonic acid;* they always dissolve, either wholly or in part, in weak acids, with a more or less brisk effervescence, and may be scratched with an iron point.

Limestones are sometimes pure, that is to say, wholly composed of lime and carbonic acid; at others, the lime is associated in intimate combination with silica, alumina,† magnesia, with quartz in grains, oxide of iron, man-

* Carbonic acid is a gas composed of one equivalent of carbon and two of oxygen: it is transparent and colourless, and incapable of supporting combustion or respiration; it combines with the alkalies, oxides, &c., forming the class of *carbonates*.—TR.

† Alumina, or oxide of aluminum as it is now termed, is the substance which forms the basis of the plastic clays.—TR.

ganese,* bitumen, or sulphuretted hydrogen.† The presence of these substances one by one, or two and two, or three and three, &c., constitutes the various kinds of limestone, which are further subdivided into different varieties.

Mineralogists distinguish the argillaceous, magnesian, sandy (arénacés), ferruginous, manganesian, bituminous, fetid, &c.; and then in each of these kinds point out varieties of form and structure, which they specify under the denominations of foliated, lamellar, saccharoidal,‡ granular, compact, globular, coarse, chalky, pulverulent, pseudo-morphous,§ concretionary, nodular (geodiques‖), incrusting, &c., &c.

It is useful to be acquainted with this nomenclature; but that which it is of the most importance for the builder to be aware of, is, that each variety of limestone furnishes a peculiar kind of lime, distinct in colour, weight, in its avidity for water, and above all by the hardness it acquires on being mixed intimately after slaking with the earthy substances known under the names of sand, pouzzolana, &c.

The work then proceeds with an analysis and explanation of several experiments, to decide upon what class the limestones belong to, and the component parts of the several kinds:—

1st. As furnishing the rich limes: 1st, the pure limestones, or such as contain only an admixture of from .01 to .06 of silica, alumina, magnesia, iron, &c., taken separately, or two and two, three and three, &c.; 2ndly, the simple, bituminous, or fetid limestones.

2nd. Such as form the poor limes: 1st, limestones associated with silica in the state of sand, magnesia, the oxides of iron and manganese, in variable proportions, but limited to .15 to .30 of the whole, whether these principles exhibit themselves one by one, two and two, three and three, or all together.

3rd. As furnishing the slightly hydraulic limes: the limestones united with clay, magnesia, iron, and manganese, the relative proportions of which being variable, but not exceeding .08 to .12 of the whole. The oxides of iron and manganese also, being present either in the relations one to one, two and two, three and three, &c., &c., or even entirely wanting.

4th. The ingredients constituting the hydraulic limes. These are the limestones containing silica, alumina, magnesia, iron, and manganese, in variable relative proportions, amounting to not more than from fifteen to eighteen hundredths of the whole, and in other respects such, that the silica always has a predominance, no matter whether the other substances appear, as one to one, or two and two, &c., &c. The iron, manganese, and magnesia, may also be entirely wanting.

5th. The minerals affording the eminently hydraulic limes are, the limestones which contain silica, alumina, magnesia, iron, and manganese, in different relative proportions, but usually limited to from twenty to twenty-five hundredths of the whole; the silica always predominating, sometimes to the extent of forming of itself more than half the whole; and the other substances only occurring one by one, two and two, or three and three, &c. It is very seldom that we meet with them all at one time. The magnesia, and still more, the manganese, are very frequently absent.

The process of burning limestone, and the construction of the various limekilns in use, are next explained, with drawings. The subject of artificial hydraulic limes is fully considered, a proper understanding of which is so very essential to the builder of bridges or waterworks.

The artificial hydraulic limes are prepared by two methods. the most perfect, but also the most expensive, consists in mixing with rich lime slaked in any way a certain proportion of clay, and calcining the mixture; this is termed artificial lime *twice kilned*.

By the second process, we substitute for the lime any very soft calcareous substance (such, for example, as chalk, or the tufas), which is easy to bruise and reduce to a paste with water. From this a great saving is derived, but at the same time an artificial lime perhaps of not quite so excellent a quality as by the first process, in consequence of the rather less perfect amalgamation of the mixture. In fact, it is impossible, by mere mechanical agency, to reduce calcareous substances to the same degree of fineness as slaked lime. Nevertheless, this second process is the more generally followed, and the results to which it leads become more and more satisfactory.

We see that by being able to regulate the proportions, we can also give to the factitious lime whatever degree of energy we please, and cause it at pleasure to equal or surpass the natural hydraulic limes.

* We usually take twenty parts of dry clay, to eighty parts of very rich lime, or to one hundred and forty of carbonate of lime.¶ But if the lime or its carbonate should already be at all mixed (with clay, Tr.) in the natural state then fifteen parts of clay will be sufficient. Moreover, it is proper to determine the proportions for every locality. In fact, all clays do not resemble one another to such an extent as to admit of their being considered as identical: the finest and softest are the best. * * *

Quick-lime, taken as it leaves the kiln, and thrown into a proper quantity of water, splits with noise, puffs up, produces a large disengagement of hot slightly-caustic vapour, and falls into a thick paste: in this state it is termed slaked lime. * * * * * *

This method is generally adopted, but they abuse it strangely. They reduce the lime to a milky consistency in a separate basin, whence it runs off into a large trench. Thus drowned, it loses the greater part of its binding qualities. * * * * * *

All lime, when first slaked by immersion, and then exposed to the contact of the air in a sheltered situation, becomes gradually loaded with carbonic acid and water, but only up to a certain point: the amount of this change, as well as the time required for it, varies with the quality of the lime. * * *

Numerous preliminary trials have shown, that the quantity of water employed in slaking lime exerts a powerful influence on the hardness of the hydrate which results. And this is easily understood. Too little water fails to bind the mass; an excess swells out the stuff, which remains light, porous and friable, if it does not shrink proportionably in drying. Plaster* mixed thin, or stiff, exhibits a remarkable instance of this fact.

The pasty consistency which produces the greatest hardness, is at once ductile and firm. We have given it the name of "clayey," because, in fact we can compare it to nothing better than clay which is in a state of readiness for the manufacture of pottery. It is this kind of consistency which we constantly gave to the pastes of the hydrates made use of in our experiments.

The author classifies the several kinds of mortars under four heads:—1st, "*very energetic*" mortars, which set after immersion within the third day, and acquire the hardness of a brick at the end of one year 2nd, "*energetic*" mortars, which set between the fourth and eighth day after immersion, and at the end of the year acquire the hardness of soft stone; 3rd, "*feebly energetic*" mortars, which set from the tenth to the twentieth day after immersion, and at the end of a year acquire the hardness of dry soap; 4th, "*inert*" rich limes in paste, the presence of which makes no alteration whatever in the manner in which the lime would behave if immersed without mixture. Having established these definitions, the author proceeds to give the result of various experiments, and explain the manufacture of artificial pouzzolanas.

The first and best method consists in previously pulverizing the clay, the psammite, or the arene, which we have selected, and then strewing a layer of it, about a centimetre (four-tenths of an inch nearly) or more, on a plate of iron heated to a point between a cherry red and forging heat. We leave it there till it be raised to the same degree, for a space of time which varies, for each kind of material, from five to twenty-five minutes. We take care to stir the powder continually with a small rod, in order that the whole of the particles may be uniformly calcined. The clays or ochrey psammites, of brown, or orange red, or a full blood red, require a heat of a higher degree and sustained for a longer time, than the others. Twenty minutes, and an incandescence nearer the forging temperature than a cherry red heat, appear to be the limits proper for them. * * *

The second method consists in rendering the material exceedingly porous and permeable to the air, if it be not so already, and then roasting it in the manner of bricks, but in the highest part of a limekiln, where the heat is insufficient not merely to vitrify, but even to give a fusible brick the degree of burning necessary for commerce.

We make the material porous, by kneading it with an equal quantity of quartzose sand, after which it is divided into loaves or prisms, which are left to dry and harden properly. This plan is particularly suited to the compact and fusible clays; but the pouzzolana which results from it has the defect of being mixed with sand; an inconvenience which might perhaps be avoided, by substituting for the quartzose sand any combustible substances in a finely divided state, such as sawdust, chopped straw, wheat-chaff, &c., &c. * * *

All clay, principally composed of silica and alumina, and moreover, fine, soft to the touch, and which contains more or less of the oxide of iron, with little or none of the carbonate of lime, will give a "very energetic" pouzzolana if it be treated by one of the two first methods described above. * * *

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* Manganese is a metal similar in appearance to iron, but rarely met with in the metallic state.—Tr.

† Sulphuretted hydrogen is a compound gas, containing one equivalent of sulphur, and one of hydrogen. It is liable to be extricated on the decomposition of a metallic sulphuret by water, whence it is not an uncommon natural product.—Tr.

‡ The whitest and most esteemed (granular limestone), from its resemblance to sugar, has been termed by the French mineralogists chaux carbonatée saccharoide; but it has more generally, from its important uses in the arts, obtained the name of *Statuary Marble.—Phillip's Mineralogy*, edit. 1816.

§ Minerals exhibiting impressions of the forms peculiar to the crystals of other substances, are said to be pseudo-morphous.—*Ibid*, p. 1.

‖ A geode is a hollow ball. At Oberstein, in Saxony, are found hollow balls of agate lined with crystals of quartz or amethyst, which are termed geodes.—*Ibid*, p. xlvi.

¶ The 80 parts of lime here mentioned, refer to the lime in the unslaked condition, and the 140 parts to the uncalcined mineral. If the lime be slaked, the proportion should be increased to 110 parts. The mixture here described, is such as to produce the hydraulic limes, whose properties are similar to the Aberthaw, the analysis of which, by Mr. Phillips (Annals Phil., new series, vol. viii., p. 72), shows it to correspond nearly with the proportions here recommended; as it consists of 86.2 of carbonate of lime to 11.2 clay (with 2.6 water and carbonaceous matter), being at the rate of 18.2 parts clay to 140 of the carbonate of lime. The cements now commonly in use in England are much quicker setting than these, and differ from them in being *unslaked*. They contain a greater proportion of clay, but may be manufactured artificially with equal ease, by combining such relative quantities of chalk, or lime, and clay, as will suit the purpose intended. Parker's Patent Cement, as analysed by Sir Humphry Davy (Ure's Dictionary, art. Cement), contains 45 per cent. of clay to 55 carbonate of lime. The Yorkshire cement, 34 clay to 62 carbonate of lime. The Sheppy, 32 clay to 66 carbonate of lime. And the Harwich, which is a quicker-setting cement, 47 clay to 49 carbonate of lime (Practical Remarks on Cements, p. 32.) These facts may serve as a guide towards the admixture of ingredients, for the formation of a compound suited to our purpose, in any situation; but for the exact proportions, recourse must be had to experiment in *every case* when new materials are to be employed. In fact, so different may be the chemical properties of apparently similar materials, that no results however definite, or however successful in one locality, can with safety be trusted to in another, as more than a clew for the direction of similar experiments, applied to the new materials at our disposal. For such trials, the process of manufacture and the choice of clay, &c., are explained in the text; and it is therefore merely necessary to add, that when aiming at the production of a compound similar to Roman Cement, it would be necessary to increase the dose of clay to about that indicated by the composition of the materials from which our cements are manufactured, and in which it varies, as above shown, from one-third to one-half of the whole. Particular attention should be paid to the perfect amalgamation of the materials; and the degree of calcination just suited to it should be carefully observed, before attempting to imitate the process on the large scale.—Tr.

* Plaster of Paris is here meant.—Tr.

The translator adds :—

Two varieties tried by myself, and calcined according to the first method, afforded excellent artificial pouzzolanas. One of them, a stiff brown clay, which did not effervesce in nitric acid, and which turned brick-red after calcination, set in three hours with half its weight of rich lime. The other, a white kind of pipe-clay, in which silica predominated, but containing no carbonate of lime, and which changed to a light pink colour after burning, set in six hours when made into a stiff paste with lime in the same proportions. After five and a half months' immersion, no impression whatever could be made upon the first of these cements, by the action of an instrument exactly similar to M. Vicat's (described at the end of the volume, and represented in Plate II.): upon the second, a very slight indentation was made by the needle, measuring, as nearly as could be ascertained, 0.0125 of an inch.—Tr.

The manufacture of mortars is too frequently left to the sole control of the bricklayer's labourer, without any guide or rule; to obtain a good and lasting mortar requires particular care in the proper mixture of the ingredients, that the lime may be perfectly incorporated with the sand or other substances, and that every particle of these may be surrounded with a coat of lime.

In whatsoever way it may have been slaked, lime ought to be first brought to the condition of a thoroughly homogeneous paste, and then to be mixed with the ingredients destined for it.

This paste ought to be as stiff as possible, whenever it is intended to act the part of a matrix amongst hard and palpable grains, which preserve a sensible interval between one another. Such is the case with mortars, or mixtures of lime and sand.

It may have a more or less thin consistency, when, with a pulverulent substance, whose grains are impalpable, and at the same time absorbent, we would form a whole of a homogeneous appearance, in which the eye is unable to discern any one of the constituent elements. This is the case with the calcareous cements, or the mixtures of lime with the pouzzolanas, arenes, clays, or psammites.

But in every possible case, the resulting mixture, be it mortar or cement, must exhibit a good clayey consistency, according to the definitions laid down in that respect. * * * * *

Mortar in every season ought to be prepared as much as possible under cover, whether it be to avoid the rapid desiccation which takes place in summer, or to obviate the still more serious inconvenience in the rainy season. In the latter case, we ought to deviate a little from the principles which we have laid down in the preceding pages, and choose the hydraulic lime slaked by immersion, in preference to that produced by the ordinary mode; and this in order to have it in our power at pleasure to absorb the water contained in the wet sand; without this plan, it is impossible to obtain a stiff mortar.

In summer, on the contrary, the lime in paste is not always sufficient to moisten the sand, which is sometimes hot. It then becomes indispensable to add water, but gradually, and with the greatest caution. One could hardly believe, without witnessing it, how very small a quantity is sufficient to drown the mixture.

It is quite evident, that a very stiff mortar cannot be used with dry and absorbent materials. When we have materials of this kind, they must be watered without ceasing, and kept in a perfect and permanent state of imbibition. The whole secret of good manipulation and right employ, is condensed in the following precept: '*Stiff mortar, and materials soaked.*' Our bricklayers, on the contrary, seem to have taken for their motto, '*Dry bricks, and drowned mortar.*' * * * * * *

In general, all mortars become pulverulent when, after being applied, they are exposed to a rapid desiccation. The influence of such a desiccation becomes the more fatal, the more eminently hydraulic the mortars are. They may then lose four-fifths of the strength which they would have acquired by drying slowly. It is therefore proper to water the masonry when we build during the hot season; and this in such a way, as never to permit the mortar to whiten, and thus part with the water necessary for its solidification.

On the Continent they appear to have a mixture for foundations similar to our concrete; it is called "*beton.*" It is made by mixing lime as a matrix with stones, fragments, and rubbish: in the work before us, there is no satisfactory account of the increase and decrease of the materials in bulk, after the *beton* is made up. In this country we find among builders very considerable differences on the mixture and proportions of the ingredients of concrete, and also the amount of its decrease. Mr. Godwin, in his excellent treatise, states, "that the ingredients, when mixed, lose one-fifth of the bulk before mixed." We have consulted several eminent builders on the subject, and none allow in their calculations anything like such a decrease: one builder who has made numerous experiments on mortars and concrete, states, that he never allows in his calculations for a greater decrease than from one-fourteenth to one-sixteenth; another builder, who is also performing some large works where concrete is being used in considerable quantities, states that the decrease is about a seventh, and from calculations he showed us, we are disposed to think that his opinion is correct: these differences show how necessary it is for several trials and experiments to be made on a large scale; the differences may very likely be owing to the various qualities of the limes, and the proportion of sand mixed with the ballast. We intend to make every inquiry on the subject, and have now an opportunity of trying on a large scale the actual decrease, and also the expansion after it has set in the foundation, which we shall take an early occasion to lay before our readers. It appears that the translator of the work before us agrees with Mr. Godwin.

For foundations and works of that kind, the use of *concrete* as a substratum in dangerous soils seems in England to be fast superseding every other method, and it offers so valuable a resource in so many difficult situations, that I cannot omit the opportunity of doing the reader a service, by giving a short account of its nature and preparation. Concrete is a composition of stone or rubble and sand with fresh-burned *stone* lime (ground to powder without slaking), in the proportions of from one-fifth to one-ninth of lime, to one of the mixture of rubble and sand. These ingredients should be well blended together *dry*, and as small a quantity of water added as will bring them to the consistency of mortar, and then, after turning over the materials with the shovel once or twice, thrown as quickly as possible into the foundation, from a height of eight or ten feet. It sets very quickly so that it is desirable that the mixture should be made at, or close to the height from which it is precipitated, and after being expeditiously spread and brought to a level, or puddled, it ought not to be again touched. The best proportions of admixture of the stones and gravel or sand, are such as produce the greatest possible condensation, and depend therefore upon the dimensions of both; and the principles by which these proportions may be determined with accuracy, will be found in a note in p. 87, it being remembered that the greater the condensation, or the greater the real bulk of the materials packed into a given space, the *less* the quantity of cementing matter necessary to bind them together. The concrete used near London is composed of Thames ballast, containing about two of stones to one of sand, which proportion Mr. Godwin, the author of a valuable essay on this composition, considers to be the best; and as the size of all the stones used is limited to the bigness of a hen's egg (all beyond that dimension being broken), it will be seen that this practical result is in perfect accordance with the experiments referred to in the note above quoted. The quantity of lime (if *hot* from the kiln, and perfectly well burnt and pulverized) should be such as is sufficient to form good mortar with the *sand* (only), which is the simplest rule to go by, as by it the exact proportions in every case can be decided according to the nature of the materials, and the energy of the lime used, according to the experience and judgment of the architect who employs them. I have not heard of concrete being employed under water, but when once consolidated, it may be exposed immediately to its action without risk. In setting it expands in the same manner as hydraulic lime, which renders it very valuable in some situations. This increase of dimensions amounts to three-eighths of an inch in a foot in height on the first setting of the concrete, and it continues to expand insensibly for a month or two afterwards. It is proper to add, that this expansion follows a previous condensation of about one-fifth in bulk, by which the ballast and lime are found to be contracted after being incorporated together.—Tr.

We have entered more fully into this work than we at first intended, but the importance of several parts of the work has induced us to make our extracts rather full; we have not been able to touch upon the valuable information and tables contained in the Appendix, but we must conclude by recommending the work itself to the attentive perusal of the Profession.

Papers on Subjects connected with the Duties of the Corps of Royal Engineers.

The excellent example of the Institute of Civil Engineers, in publishing the first volume of their Transactions, has brought forth similar works from the Architects, and the Corps of Royal Engineers; the latter work is now before us, and contains many very interesting papers, but not to such an extent as we were led to expect, from the well-known abilities of several scientific members of the Corps, which we fear may rather arise from a punctiliousness in appearing before the public, than for the want of talented means. However, we must hope that in their future works there will not be such backwardness; in these times men must not have any narrow views in keeping secret their improvements and inventions; let all scientific men go hand-in-hand in furthering the objects of their profession, and we shall soon have works in this country that will vie with those of the ancients or moderns, no matter in what part of the world.

The first paper is strictly professional, appertaining to the Royal Engineers; it contains a very interesting account of various *Assaults* by Lieutenant-Colonel Reid. The next three papers are on *Concrete*, by Lieutenant Denison: one of them is a description of the construction of a *Bomb Proof*, made with Mr. Ranger's patent concrete, and the particulars of the effects produced by the fire of artillery on the *Concrete experimental Casemate*; it appears that it stood the fire of seven shells and two 24-pounders, which began to operate on the works. The following paper is *A description of the Concrete sea-wall at Brighton, and the Groins which defend the foot of it*, by Lieutenant-Colonel Reid. This paper sets at rest the erroneous opinion formed by many builders, that mortar could not be made with sand from the sea-beach or sea-water, as it would not set: it appears, from the Report before us, that both were used, and with complete success. It is scarcely

known to what extent concrete may be advantageously used; we feel convinced that it might be introduced for every variety of building, and with great economy, particularly near rivers where clean ballast can be obtained, or near gravelly soils (the gravel should be washed, to clean it from alluvial impurities): in such situations concrete might be introduced at one-half the cost of brick, and would have the appearance of stone. Mr. Barry has very successfully introduced it in the new front of the College of Surgeons, Lincoln's-Inn-Fields, also in the front of a house in Pall-mall. Mr. Ranger has built a small church with concrete, also several docks, wharfs, and numerous other works; and has used it in the sea-wall at Brighton, with great success, as appears by the Report before us.

The portion of the concrete sea-wall now constructing at Brighton is 3,000 feet in length: and this portion, together with what is already finished, will make a length of about 2,000 yards of wall, the whole constructed of the sand and shingle from the beach alone, cemented by a water-lime from the neighbourhood, and mixed up with salt-water, the water having been taken from the sea itself, until it was found more convenient to sink wells immediately at the back of the wall, where some fresh water becomes mixed with the salt.

The section of the wall is two feet and a half thick at the top, upright at the back, without counterforts, and battering in the front with a slope equal to one-third of the height. The foundation goes down to the chalk, and from the bottom to the top, it will in one part be seventy feet high: in many, forty feet.

The lime is not ground, but slaked at the work, as it is going to be used, and first mixed by hand with three parts of sand. It is next wheeled to a plug-mill, and then intimately mixed with three parts more of shingle, after which it is wheeled away and thrown upon the wall. In its semi-fluid state, it is retained by boards ledged together. The wall being backed up as it proceeds, the rear ledges are easily supported by struts. To retain the front ones in their places, ties are used made of saw-plate iron, in strips passed through the boards, and keyed at the outer end. At the inner end, long iron needles pass through holes in the strips of saw-plate, and pin them to the ground. These needles and strips are easily drawn out, and used again as the work proceeds. The surface sets the second day, and after ten days the ledged boards may be removed. * * *

The lime used in the concrete wall is taken from a pit near Bycombe, eight miles north of Brighton, and is a weak water lime. The lime used for a row of houses now building of concrete, at Brighton, is from the pit of Southerham, near Lewes, and is also a water-lime. According to Mr. Mantell (who has so long studied the geology of the south-east of England), both these pits are in the strata of chalk-marl, lying under the lower chalk formation; and it is to be found at the northern escarpments of the South Downs, and the southern of the North Downs. These two lines are similar to the Dorking and the Halling (near Rochester) limes; and it will be intersting to ascertain, whether all the limes burnt from the same stratum have the same property.

It has been stated above, that the great sea-wall (at least in its new state) cannot resist the beating of the surge against it; and that its security depends upon the system of groins in its front. It is however deserving of remark, that some of the same concrete has been used near low-water mark, to fasten some piles at the lower extremity of one of the groins, which were loosely placed in large holes in the chalk bed of the sea, and into which concrete was poured, in its usual semi-fluid state. The place where it is, is almost always covered by the sea; yet it has become so hard that it resembles rock, and it was not found practicable, on examining it, to detach a single pebble from the mass without procuring iron tools.

Another trial of laying this concrete under sea-water has been successfully made at the outer end of the Brighton chain-pier. Some time back, large artificial stones of concrete made of the Bycombe line were moulded, and after being allowed to harden on shore, they were placed at the feet of the outermost set of piles of the Brighton chain-pier, to aid in securing them. These also have become very hard, and are now encrusted with shell-fish; whilst the chalk thrown in at the same place is soft and pulpy, and evidently wearing by the action of the sea.

These experiments led Mr. Wright, late surveyor to the Brighton Commissioners, and now employed upon the Dover Railway, to propose to construct a substantial groin of concrete, to be coped with stone, and having sides with gradual slopes. The Brighton Commissioners, however, have not authorized this trial to be made, which is to be regretted.

The contract price of the concrete in the great wall is fourteen shillings for each square reduced to fourteen inches thick, the Brighton mode of measuring, which is equal to three shillings and fourpence a cubic yard.

The paper by Lieutenant Luxmore, giving a *Description of the Groins used on the Coast of Sussex for preventing Encroachments by Sea*, is instructive to the Engineer.

A short Description of the Use and Construction of Groins.

A groin is a frame of wood-work, constructed across a beach, between high and low water, perpendicular to the general line of it; either to retain the shingle already accumulated, to recover it when lost, or to accumulate more at any particular point.

The component parts of a groin are piles, planking, land-ties, land-tie bars, blocks, tail-piles and keys, and screw-bolts.

The length of a groin depends on the extent, and the requisite strength of its component parts on the nature, of the beach on which it is to be constructed. Those at Eastbourne, on the coast of Sussex, of which the following is more particularly a description, are from 150 to 250 feet in length; and the beach at that place being very rough, consisting of coarse heavy shingle and large boulders, they require to be composed of proportionably strong materials to resist its force.

The piles are from twelve to twenty-five feet long, and eight by six inches and a half scantling, shod with iron.

The planking is in lengths of eight, twelve, and sixteen feet, two inches and a half thick, and with parallel edges.

The land-ties are of rough timber, from twenty to twenty-five feet long, and large enough at the butt end to receive the bars.

The land-tie bars are thirteen feet six inches long, and twelve by five inches scantling.

The land-tie bar blocks are about two feet long, and of the same scantling as the piles.

The land-tie tail-keys are about two feet six inches long, and six by two inches and a half scantling.

The above materials are of oak or beech.

The screw-bolts are of inch round iron, two feet nine inches and a half, and two feet one inch and a half long, in equal proportions.

The relative proportions of the component parts are, four piles, one land-tie with tail-piles and keys, one land-tie bar with two blocks, two long and two short bolts, about 180 square feet of planking, and about 140 six-inch spikes for every sixteen feet in length; and the expense of a groin, constructed with materials of the above dimensions, may be calculated at about 30*l.* for the same length.

General Rules observed in the Construction.

When the object in constructing a groin is to recover shingle, or accumulate more, the first pile is driven at the high-water mark of neap tides, leaving its top level with that of spring tides. The next is driven at the point on the sands beyond the bottom of the shingle, to which the groin is to extend, leaving about four feet of it out of the beach.

The tops of these two piles may be taken for the general slope of the groin, unless the beach should be very steep, and much curved, in which case it becomes necessary to follow its curvature in some degree.

From the high-water mark of neap tides, the piles are carried back nearly level to that of spring tides, and as much further as may be considered necessary.

The piles are driven four feet asunder from centre to centre, and so as to admit the planking between them alternately; and they should be sunk about two-thirds of their length.

The longest piles, are placed between the high-water mark of neap tides and the bottom of the shingle, particularly from twenty to forty feet below the former point.

The planking is, if possible, carried down to about two-thirds from the tops of the piles, and kept parallel with them.

The land-ties are placed about one-third from the top of the planking, (supposing the latter to commence from the tops of the piles,) and their tails are sunk to the level of the bottom of the planking, or as nearly so as possible.

The method of uniting the component parts of a groin is shown by the accompanying plan, elevation, and section.

The land ties have, in some cases, been placed on either side alternately, in which case one-fourth more land-ties, bars, &c., are required in the construction, because it then becomes necessary for the land-ties to overlap. The principal reason however for giving the preference to placing all the land-ties on the westernmost side is, that when placed alternately, those on the easternmost side are, from the general prevalence of westerly winds, liable to be left wholly exposed; and when in that state for any length of time, they are apt to free themselves from their tail piles, and endanger the safety of the groin.

The planking should only be carried up to about one plank above the land-ties at first, and afterwards gradually completed, as the shingle accumulates, which should pass over it at about high-water, so as to form itself on the same level on both sides at the same time; for when the planking is carried up too high at first, the shingle is removed from the leeward side, by the general motion of its surface, in the direction in which the sea is running, before it has accumulated high enough on the windward side to pass over and supply the deficiency; so that when it does pass over, the reaction of the sea on the leeward side produced by the then difference of level, prevents it from settling there. Before this error was discovered, it frequently happened, when the wind continued in the same quarter for any length of time, that the planking became exposed to the very bottom on the leeward side, the shingle accumulated on the windward side passed under it, and the groin becoming undermined was soon destroyed.

When a set of groins are constructed, they are placed from fifty to one hundred feet or more apart, according to their length.

The six papers by Mr. Howlett are particularly interesting to the profession. The first, *For determining altitudes with the Mountain Barometer*; the second, *A new method of making perspective drawings from plans and dimensions*, which is very simple and easily acquired. The next paper explains a *Field Protractor and Sketch Book*, useful in making a sketch of a country on a small scale, by taking the distance by stepping, allowing 2 feet 6 inches to each step, or 40 steps for 100 feet, and the angles by a small pocket surveying compass, and laying down the lines and angles in the Sketch Book as you proceed.

The following paper describes a very simple *Substitute for a drawing-board*, which is frequently required in a country survey; a good straight edge or flat ruler is fixed on the top of a table near the edge with a pair of small clamps, and against the ruler is worked the back edge of a T square, the stock being flush with the blade on the under side. Mr. Howlett's new *Station Pointer* is very useful; so, also, is his *New Line-divider and universal Scale*, of which the following description is given.

This simple instrument is for dividing a given space into any number of parts, and for drawing parallel lines to any scale with a common drawing pen, more accurately, and in most cases more expeditiously, than can be done by the ruler and compasses.

The next paper is on the *Construction of the Rideau Canal*, by Lieutenant Frome, which fully describes the whole of the works, their construction and estimate; and contains a variety of information useful to the Engineer.

There is a paper by Lieut.-Colonel Reid, giving *A short account of the failure of part of the Brighton Chain Pier in the Gale 30th November*, 1836. If we could always be furnished with accounts of failures in engineering works, it would tend more to correct errors and mistaken notions than many years of arduous labour and research.

The paper by Capt. Savage, giving *A description of the Landing Wharf erected at Hobbs' Point, Milford Haven*, contains full particulars and drawings of the four diving-bells employed on the works, together with a description of the machinery for working them, and of the mode of executing the works under water; the whole highly instructive, particularly to those who have under-water works to execute: we are satisfied that such works, in many instances, might be executed by diving-bells, which would save the enormous cost of coffer-dams, steam-engines, pumps, &c. The repairs and removal of the damaged stone at the foundations of the piers of Westminster Bridge were entirely done with the diving-bell; and the construction of the Lara Bridge is another instance, where the whole of the piers were built under water in a rapid stream by means of a wooden diving-bell, constructed by Mr. Rendell the Engineer. There are several other works in this country which have been executed, at a comparatively small expense, by the use of the bell.

A report on copper pontoons, by Colonel Pasley, forms the subject of the next paper, wherein he recommends the Neapolitan pontoons.

The 18th paper is *An investigation of the position of the horizontal axis of a self-acting sluice gate*, extracted from an article in the "Memorial du Génie." The author has entered into an algebraical calculation to find the equation of equilibrium for sluice gates.

The concluding paper is a report on *Mr. Kyan's process for the preservation of timber from dry-rot*. We shall, at present, refrain from making any remarks on this paper, as we are endeavouring to make ourselves masters of the subject by acquiring all the information we possibly can obtain as to the *infallibility* of the remedy, before we presume to give an opinion upon the subject.

An Appeal to the Public on the Subject of Railways. By George Godwin, Junr., *Associate of the Institute of British Architects.*

This Pamphlet contains many convincing arguments showing the advantages of Railway communication; we recommend the enemies of Railways, and several of the fastidious members of the House of Commons, to read this brief appeal, in the hope that it will make them converts.

A Tabular Chronological Epitome of the History of Architecture in England. By George Godwin, Junr., *Architect.*

This Epitome is printed on a card, and shows at one view an approximation to the date, duration, and characteristics of the principal styles which have prevailed in some examples, with names of the Architects. A few similar Epitomes on Architecture would be an excellent appendage to the Architect's office: by suspending them in the waiting-lobbies, the impatient moments of parties might be instructively occupied.

Original Geometrical Illustrations. By John Bennett, *Engineer.*

This work contains a great variety of geometrical figures, ingeniously and simply divided into equal and proportional parts: their simplicity caused us to doubt whether we had not seen some of the illustrations in other works, but on referring to several, we could not find them. The author, however, does not attempt to give a mathematical demonstration to prove their correctness, nor does he show in all cases how the operation of sub-dividing is to be performed; he appears to consider that the whole is so self-evident, that any one can understand them. This we readily admit; and for general purposes, and for most men who are not fond of Algebraic formulæ, a practical work of this kind is quite sufficient. We cannot very well enter into an explanation of the work without illustrating our review with copies of the engravings; probably we may allude to it again in a future Number.

Temples, Ancient and Modern; or, Notes on Church Architecture. By William Bardwell, *Architect.* London: James Fraser and John Williams.

We received this work just as we were going to press, and have not had an opportunity of taking more than a cursory glance;—it is beautifully got up—the engravings and wood-cuts are executed in a masterly manner. The text appears to be written with great judgment and research; in our next Number we shall enter more fully into this work.

A Review of the Professional Life of Sir John Soane, *with some Remarks on his Genius and Productions; read at the Institute of British Architects. By* Thomas Leverton Donaldson, *Fellow and Honorary Secretary, &c.* London: John Williams.

A faithful Review, written in a concise and classical style.

The following Works were received too late for review, and will be noticed in the next Number.

Prolusiones Architectonicæ, or Essays on Subjects connected with Grecian and Roman Architecture. By Wm. Wilkins, R.A.

Appendix to Elements of Architectural Criticism. By Joseph Gwilt, Architect.

Thoughts on the Experience of a better System of Control and Supervision over Buildings erected at the Public Expense, and on the Subject of Rebuilding the Houses of Parliament. By Lieut.-Colonel the Hon. Sir Edward Cust.

Treatise on Drawing Instruments. By F. W. Simms, C.E.

Preparing for Publication.

Before our next Number is out, we expect two very important Works will be published connected with the Profession.

The Public Works of Great Britain, containing 130 folio plates, beautifully engraved, copied from the Original Drawings.

Railway Practice, containing copies of the Drawings and Specifications of several important Railways.

COHESIVE STRENGTH OF BAR IRON.

The mean result of numerous experiments on wrought-iron, detailed in the *Journal of the Franklin Institute*, made by a Committee of the Institute at the request of the Treasury Department of the United States.

	Specific gravity.	No. of Experiments.	Strength* in lbs.
Missouri Bar Iron	7·7708	22	47909
Ditto Slit Rods	....	2	50000
Tennessee Bar	7·8046	21	52099
Salisbury, Connecticut	....	40	58009
Swedish Bar	7·4785	2	58184
Centre County, Pennsylvania	....	15	58400
Lancaster County, Do.	7·7400	2	58661
English 'EV best patent Cable bolt Iron'	7·6897	5	59105
Do. Do. hammer hardened	7·6897(!)	8	71000
Russian Bar	7·8014	5	76069
Phillipsburgh Wire, diam. .333	....	13	84186
Phillipsburgh Wire, diam. ·190	....	5	73888
Phillipsburgh Wire, diam. ·156	....	5	89162
Cast Steel	....	1	130681

The experiments were made at ordinary temperatures on bars of Iron, averaging ¾ inch by ¼ inch.

* Breaking weight of an inch square bar, deducting friction.

LAW PROCEEDINGS.

SECONDARIES COURT, *Sept. 2nd.*

THE BIRMINGHAM, BRISTOL, AND THAMES JUNCTION RAILWAY COMPANY, *v.* LEWIS.

This was an action brought by the Company against the defendant, who is a proprietor of twenty-five shares, to recover the amount of the calls made by the directors, and interest thereon.—The secretary proved the defendant to be a proprietor of twenty-five shares, and that there was a call of 2*l.* per share due in October last, and another of 1*l.* subsequently, and produced the act of parliament, giving power to the directors to sue and to recover the amount of any calls duly made, with interest thereon until paid up.—The jury found for the plaintiffs, damages 75*l.*, and interest.

Warwick Vase.—There can be no doubt that immense treasures are still buried under the ruins of Alexandria, but whether they will ever be discovered, will depend upon the pacha's necessities, as he may need the ruins of ancient temples for building forts, or bridges. New discoveries are constantly made, and between my first and second visit a beautiful vase had been discovered, pronounced to be the original of the celebrated Warwick Vase found at Adrian's villa, near Tivoli. It was then in the hands of the French consul, who told me he would not take its weight in gold for it. I have since seen the vase at Warwick Castle; and if the one found at Alexandria is not the original, it is certainly remarkable that two sculptors, one in Egypt and the other in Italy, conceived and fashioned two separate works of art so exactly resembling each other.—*Extract from "Incidents of Travel in Egypt, &c., by an American."*

ADDRESS.

A Journal intimately connected with the Profession is generally admitted to be much wanted—whether we have adopted the right course to meet the exigency, will be for their consideration. We are now before them on our trial, if we have failed, it is not for want of exertion; we have started the work, we may safely say, in the very worst season, when there is not a Scientific Institution open that is connected with either Profession, and scarcely any information to be obtained, excepting through our own personal exertions; neither have we yet been able to complete our Foreign Correspondence and arrangements for obtaining whatever useful information can be collected on the Continent and in America; this we hope will be completed ere our next Number appears—but we trust allowances will be made. Our pages will be open to all, no matter from what quarter information or communication may come; if it be deserving of consideration or merit, it will receive an insertion in our Journal;—we are independent of all parties—no interest or affection have we for one more than another. "Open to all, but influenced by none"—it is our desire to be the organ of the Profession, to communicate what is moving, and to watch over any abuse or infringement upon the practice of either: we solicit all parties in any way connected to render us their assistance; let the Journal be considered as their own; recollect that by mutual information much may be obtained. Every professional man must be doing or seeing something new, let him take a note of it and forward it to us; it is impossible for us to be able to collect what is going forward in all parts of the Kingdom, nor can our work become interesting or useful, without such assistance; therefore, if you wish to have a Journal devoted to your service, you must give it support by contributions. To our Professional Friends who are abroad do we also appeal; if we contribute to them what is going forward in England, let us ask in return for such information as may be connected with the Profession in the quarter of the globe where they are residing or travelling. Nor let it be considered, because our Journal is published at such a trifle as *Sixpence* per Month, that it will be undeserving of notice; look to our pages, and it will be found that our humble Journal contains as much matter as is to be found in many octavo and quarto volumes that are published at twenty times the price: it will be our anxious duty and study to devote our energies to the service of the Profession, which we hope will be crowned with success, and their approbation.

PROSPECTUS.

The object of this Publication (which will be continued monthly) is to afford a medium of communication to all parties interested in either of the above Professions.

It will contain Descriptive Particulars of Important Buildings, Manufactories, Warehouses, Railways, Docks, Bridges, Piers, Harbours, Canals, Rivers, Water-works, Gas-works, Drainage, Mining, Steam Navigation and Machinery, illustrated with Engravings, Estimates, Specifications and Calculations.

It will also contain a Monthly Record and Transactions of English and Foreign Societies, New Inventions, Patents, and Public Improvements—Reviews and Notices of Books as they are published—Reports of Parliamentary Proceedings, Engineering Evidence, Standing Orders—Law Reports and Decisions; and such other useful information connected with the Profession as may make it a Work of general reference.

The Editor will be happy to receive any Communication or Drawings from the Profession and others. Particular care will be taken of such Drawings or Papers as may be intrusted to him, and they will be returned when requested.

Advertisements for Contracts, Competition Drawings; of Public Meetings, Societies, Books, New Inventions, or any other subject connected with Engineering or Architecture, will be inserted.

Communications to be addressed "To the Editor of the Civil Engineer and Architect's Journal," *at the Office, No. 57, King-street, Westminster, where all Advertisements and Books for review are to be sent.*

ORIGINAL PAPERS AND COMMUNICATIONS.

NEW STANDING ORDERS.

We cannot too early call the attention of the Profession to the New Standing Orders of the *late* House of Commons—we never witnessed any proceeding in the House that was anything like the indecent manner in which they were introduced, at a time when there was not a tithe of the members in town, and they that remained were fully engaged in securing their own seats for the future Parliament. A copy of the Orders was delivered to the members in the morning of nearly the last day of the session, and on *the same day* they were moved and carried, without allowing a single day for the members to pause and consider them, although urgently requested, neither giving the public the least notice of what they were likely to be;—we believe that the like cannot be found on the records of the House. —Orders acting retrospectively were unheard of before;—the promoters have carried their point for the present, but we trust that some spirited member will move, when they are *proposed to be adopted for the new Parliament, their rejection or amendment.* Not the slightest regard was paid to the new orders of the House of Lords, nor any consultation with their Lordships on the most obnoxious clauses;—no, the promoters of the new Orders set aside every form—every respect that was due, both to the House of Lords and the public, fearing the rejection of their clauses. If it were their wish to check the further progress of railways, why did they not do it manfully,—and bring forward a definite motion to that effect, instead of putting a stop to them by a side-wind? This sneaking kind of legislation must be put an end to; we were much surprised that the press allowed them to pass so quietly: the whole proceedings of the late House of Commons during the past session, relative to railway bills, were most unprecedented—it appeared as if certain members were strongly connected with the solicitors in putting the companies to every expense that was possible. What a farce was carried on before the Deptford and Dover Committee! Three of the Brighton Railway Companies (one of them fighting for delay) were before this Committee at one time, where all laws of evidence were totally disregarded; worthless witnesses, whose evidence would scarcely have been heard in a court of justice, were encouraged to calumnize whomsoever they pleased. The circumstances of those who had been unfortunate many years back, but were now doing well, were exposed before this Committee, simply because they had subscribed for a few shares, and their names appeared on the railway subscription deed;—not satisfied with this, the Committee must publish their names in the halfpenny sheet libels of the House. Witnesses were compelled to criminate themselves before this Star Chamber inquisition!—So disgusted were counsel engaged before this Committee, that after having made several unsuccessful attempts to check the inquisitorial proceedings, they abandoned all further resistance, and allowed the farcical proceedings to go on unchecked.

We have no complaints to make against the Standing Orders of the House of Lords, they are framed in the best spirit; instead of increasing the severity of their Orders, the House has relaxed them; formerly they required five-sixths of the capital to be subscribed, now they only require three-fourths.

We will now proceed to point out the variance between the Standing Orders of the two Houses of Parliament:—first, with regard to the plans, the Commons have, against the evidence of a most respectable engineer examined on the subject (we suppose for nothing), introduced an order that the section of the railway shall be marked on the line of the railway laid down on the plans, which we are satisfied to the uninitiated will make the plan still more complex and confused; the fewer lines there are on the plans the better are they understood.

The Lords require that the notices shall be published (excepting notices that have been given agreeable to the *then* Standing Orders) in the Gazette and Newspapers, in the months of October and November, and the plans, &c., deposited on or before the 30th day of November, and that no subscription list shall be valid unless it be proved, that previous to the introduction of the bill into the House, five per cent. upon the amount of each share subscribed for has been paid, and has been expended, or remains applicable to the purposes of the railway, at the discretion of the directors of the proposed company.

The Commons require the notices (excepting renewals of application) to be published in February and March, and the plans, sections, &c., deposited on or before the first day of March; and that it be proved that a sum equal to one-tenth part of the amount subscribed be paid up and deposited in the Bank of England or Scotland, or invested in some Government security in the name of the Clerk of the House of Commons for the time being, and of any two persons named by the promoters of the bill, the said sum or securities so to remain until the bill has either passed or been rejected by the House, or been withdrawn by the parties, &c.

A CURSORY GLANCE AT THE PRESENT STATE OF ARCHITECTURE IN ENGLAND,

CHIEFLY WITH RESPECT TO THE METROPOLIS.

Not very long ago Mr. Welby Pugin thought fit to bring out, under the title of 'Contrasts,' a most extraordinary volume, the object of which was to decry all his professional brethren—at least, all those to whose works he referred,—and to represent architecture as at the very lowest ebb in this country. Since then he has attempted to defend it in two seperate pamphlets, one entitled a "Reply to observations which appeared in Fraser's Magazine for March, 1837, on a work entitled 'Contrasts;'" the other, "An Apology for a work entitled 'Contrasts,' being a defence of the assertions advanced in that publication against the various attacks lately made upon it;" for although he had run quite a-muck at every one else, Mr. Pugin is exceedingly thin-skinned and sensitive himself, and notwithstanding that he had satirized—we may say, vilified the whole profession, and even caricatured the styles of some of the most eminent in it, he has no relish either for *Fraserian* quiz, or more serious reproof. With that modesty which always accompanies real genius, he is fain to believe that he is a much injured, and greatly misrepresented person; and in order to vindicate his pretensions to candour, fairness, and liberality, he pours forth in his so-called "Apology" a torrent of rabid gall, against the Protestant Church and every thing connected with it, not forgetting sectarians, and those "canting fanatics," Quakers; besides lavishing abundance of vituperation on architects and artists of every other description among us, more especially engravers and printsellers, whom he accuses of corrupting the public taste, and in some degree public morals likewise. In short, he vents himself upon every person and every thing in such a *Furioso* mood, that it is to be regretted his baptismal name is not Orlando.

It is not our intention to pursue Mr. Pugin any further—at least, not on the present occasion; we shall not therefore, among other puzzling questions that might be put to him, ask him to explain how it has happened, that—notwithstanding Roman Catholicism, both its forms and creeds, are so highly conducive to art, so potent to create and foster genius,—all the fine arts are at this moment nearly paralyzed in Italy? and that Portugal, one of the most bigotted countries, presents little better than a dreary blank in regard to painting and the sister arts; whereas, according to his notable theory, that land should have been fertile of great artists beyond almost every other! The influence attributed by him to the Popish Church exclusively must sometimes, it would seem, be inoperative—absolutely inert. But we turn aside at once from such questions, and from Mr. Pugin, to whom we have called attention merely as the fierce promulgator of opinions most offensive, and couched in the most intemperate and insolent tone—besides being indefensible in themselves, and contradicted by facts.

In order to show how ill-founded and full of sophistry is the course adopted by that redoubtable gentleman, for the purpose of making it appear that architecture is at present in the most deplorable condition among us, we need only observe, that he has been compelled to have recourse to the doubly disingenuous expedient of bringing forward some of the most paltry erections, or else the most egregious failures, he could ransack up, and invidiously to contrast such abortions with some of the finest examples of earlier periods; and also of suppressing what is creditable to contemporary talent, and to our own times. Such being the case, we cannot perhaps do better than here exhibit to our readers a *contrast* of a very different kind. We will therefore take a hasty glance at—we ought perhaps to say enumerate, the principal structures that have been erected in the metropolis alone within about thirty years, that is during the regency and the two last reigns. In that comparatively very brief space of time, more has been done than during the whole of the preceding century; and many of the buildings erected of late years must be allowed, by every competent and unprejudiced judge, to be greatly superior to anything of the same class belonging to the immediately preceding period. Now, whatever the *candid* Mr. Pugin may think—and for candour he takes very great credit to himself in his book—we hold this to be an equally fair and rational mode of ascertaining whether we are actually advancing or retrograding, instead of making such preposterous comparisons as he has chosen to do;—a method, by-the-by, both invidious and discouraging, and one the *animus* of which cannot be mistaken, the censure being totally unqualified. Neither is it admitted, even in general terms, that if we are still greatly behind our ancestors, in many respects, we are at least very much superior to our immediate predecessors.

We are, we hope, ourselves quite as ardent though less bigotted admirers of our ancient English architecture as the "Preterpluperfect Goth;" nor do we pretend that modern times have as yet produced even a single edifice that will stand the test of comparison with York Cathedral, King's College Chapel at Cambridge, and other masterpieces of that kind. But then we have produced structures, even in the Gothic and Tudor styles, that may fairly be pronounced of first-rate merit when *contrasted* with the pitiful attempts of the last century. We need only mention the Hall at Christ's Hospital Newgate-street, the Free Grammar School at Birmingham, and Cossey Hall in Norfolk. That this last-mentioned edifice should not have been in any way alluded to by Mr. Pugin, is indeed surprising, since it belongs to a Roman Catholic family; but, it seems, neither his remarkable candour nor his flaming Catholicism could prevail upon him to quote even a single example tending in any degree to invalidate his general proposition: not so much as an exception was to be admitted. Well! the 'candour' of some persons is absolutely incomprehensible!

It must, indeed, be admitted, that we no longer build pompous cathedrals, or lordly abbeys and castles, and that for one very plain reason—because we have no occasion for them. But we do erect numerous structures of various other kinds, some few of which may be pronounced even magnificent, and many exceedingly elegant and beautiful: they are moreover for the greater part, such as our ancestors were either totally unacquainted with, or bestowed little architectural finish upon. Foremost among them we may place our metropolitan bridges, not to mention many other public works of a similar class in different parts of the kingdom, which, for magnitude of undertaking, and boldness of conception and execution, are difficult to be paralleled. On the other hand, the generality of our modern churches are, with one or two striking exceptions, rather poor and inconsistent in their architecture; which last-mentioned defect is in a great measure to be ascribed to our endeavouring to adhere to models intended for the Romish service and its ceremonies, instead of boldly setting them aside altogether, and allowing free scope both to our ingenuity and our taste in devising such arrangements and embellishments as would be more suitable for a modern Protestant Church; whereas at present we suffer ourselves to be checked by precedents which we dare not entirely abandon, yet to which we cannot conform with much propriety or success.

With the exception, however, of that single class of buildings, which certainly does justify some reproach, nearly all the rest show that architecture has made a very rapid stride among us since the commencement of the present century. This, like all similar propositions, is of course to be understood *cum grano salis*; for we do not mean to assert either that there is not a single building of the preceding period that is not quite eclipsed by those which have been since erected; or that every thing erected within the last thirty or thirty-seven years manifests a decided improvement. On the contrary, there are many positively bad, or, if not altogether bad, very inferior; and be it observed, it is such as these which the *candour* of Mr. Pugin has ingeniously singled out and thrust forward as specimens of the architectural talent of his contemporaries. Nevertheless, so far from being at all disheartened by such display, we have reason to congratulate ourselves when we find that it consists of no more than what we can very well afford to give up to scorn and derision, it being the mere husks and chaff, and not our actual harvest. Considering that architectural design has of late years increased about a hundred-fold—we do not think we at all exaggerate the matter—and that it is now aimed at in buildings where formerly nothing whatever of the kind was attempted, but which would have exhibited no other front than a naked wall, pierced with openings for the windows; it is not by any means surprising that we should so frequently meet with instances of exceedingly bad taste, of common-place vulgar decoration, of impotent attempts at design: yet even all this, contemptible as it undoubtedly is in itself, is, if occasionally disgusting, upon the whole less wearisome than the insipid blankness and monotony to which we formerly condemned ourselves.

While we freely admit that we cannot boast of much that has been done in the way of Church architecture, we may very well refer with some feeling of pride to other public buildings and works, and to the very great improvement which has taken place in Street architecture generally. Neither has the attention which has of late years been paid to architectural design been confined to the metropolis, but it has displayed itself more or less in all our principal provincial cities and towns; for instances of which we need only to name Liverpool, Birmingham, and Newcastle. And when we consider the very great variety of the buildings themselves, we must allow that architectural talent has a much more extensive field opened to it than formerly, since our Club-houses, Literary Institutions, Insurance Offices, and other buildings of that description, constitute almost entirely new classes of public edifices, while among them will certainly be found some of the most ornamental façades which now grace our streets. Besides them we have now spacious covered markets, some of which possess considerable architectural character, although it is not of that kind which arises from decoration. 'Arcades,' as they are termed, and Bazaars, form likewise another new feature in the London of the nineteenth century; and if we no longer rear such religious structures as those our ancestors have left to us, we do build, in addition to those just alluded to, public Museums, Libraries, Schools, &c., which are in accordance with the spirit of the present age, and bear honourable testimony to the spread of information among all classes. Still all this, it may be said, amounts to little more than a vague, rhapsodical declamation: well then, let us now come to particulars, which we will do by enumerating some edifices that have either been rebuilt, or erected in lieu of older ones that occupied other sites. We ask those, therefore, who remember the former buildings, whether the present Bank of England, Goldsmiths' Hall, Fishmongers' Hall, the Post Office, St. Paul's School, Corn Exchange, St. Dunstan's-in-the-West, College of Surgeons, Hall of Christ Church Hospital, St. George's Hospital, &c., exhibit so decided a falling off from the edifices they have taken place of, as justly to fill us with shame and regret! For Mr. Pugin, indeed, we will not answer, but we may venture to answer for every one else—"most assuredly not." Or should there be any one so perverse as to maintain the contrary, and assert that architecture has sadly degenerated among us, instead of other argument, we should simply refer him to two very sufficient examples of the taste of their respective periods; and if, after studying them both, our opponent should declare Temple Bar to be a much more noble and elegant piece of architecture than the Arch at the corner of Grosvenor-place, we should not attempt to reason him out of his fancy.

We ourselves have given it as our opinion, that the majority of the new churches have very little architectural merit,—are decidedly inferior to most of the other buildings of the same date; still there are one or two marked exceptions. That of St. Dunstan's-in-the-West has already been named by us, and we now add those of St. Pancras, St. Mark's North Audley-street, and Hanover Chapel Regent-street, as deserving to be ranked among the most classical pieces of architecture in the metropolis.

In regard to the New Palace, that indeed we abandon without compunction to general and unmitigated reprobation, as a most miserable work, stamped throughout by insignificance and meanness, without one single merit of any kind—any one single quality—any individual beauty, capable in the least degree of redeeming its effects and deficiencies. With the National Gallery it is somewhat otherwise, because although we are compelled to acknowledge that it has fallen greatly short of our expectation, that it is in many respects very poor and undignified, and very unsatisfactory, when taken as a whole, still it does possess one fine feature, namely—the portico; not that even this is perfectly unexceptionable, there being an air of nakedness and poverty about the entablature and pediment. Nevertheless, when viewed at such distance that the eye takes in no more than the portico, and some of the parts immediately adjoining it, it forms a noble object, and is attended with an effect very different from that of any other piece of architecture of the kind in the metropolis. We are further of opinion, that although much dissatisfaction with the National Gallery has been pretty generally expressed, it is partly owing to our having become somewhat fastidious; for the time was, and that no very distant one, when the same design would have stamped the fame of its author, and have been hailed as a splendid pile of architecture. At all events it is an acquisition, which is more than can be said of the Palace, since that has not even the merit of at all improving the site it occupies, or being a nobler object than was Buckingham House.

We have mentioned several buildings which, being only substitutions for older ones, do not increase numerically our former architectural stock; we will now catalogue such metropolitan structures as are entirely new, and which will be found to furnish a tolerably long list, although we include in it only such subjects as are of some note. To begin with those miscellaneous ones which do not admit of being classed along with others of the same kind respectively, we have the Colosseum—a building that would at one time have been regarded as a sort of prodigy, the London University, the Pantheon Bazaar, the York Column, the State Paper Office, Richmond-terrace, the new buildings at the British Museum, Exeter Hall, the Gateway into Hyde-park, and the Arch opposite to it at the corner of Grosvenor-place, the Lowther Arcade, and that on the west side of the Opera-house. Among the Club-houses, which considered with reference to architecture may be said to form an entirely new class of buildings,—we have the Union, the University, the Athenæum, the Travellers', the Conservative, and the Oxford and Cambridge (not yet completed); to which may be added the Law Institution. Under the head of schools, may be mentioned, King's College, St. Olave's School, the City of London School, and that for the indigent Blind—unless this last mentioned is rather to be considered an eleemosynary asylum, than a place of education. In the way of addition to our hospitals, we have now the Charing Cross and Westminster Hospitals; among literary institutions, the only one at present of any great architectural pretension is the London, in Finsbury Circus. Insurance-offices have given much more employment to the profession; and among them we may notice the Atlas, the British, the County, the Law Life, the Legal and General (now building), the Globe (do.), and the Marine (do.). We might without difficulty very greatly extend this list; and in fact, we ought not to pass over in entire silence the very tasteful little building in Ebury street, which was till lately the Pimlico Grammar school; but we would rather lay ourselves open to the charge of omitting some things we might have named, than of inserting whatever we could muster up, in order to make as great a display as possible. Nay, we do not pretend to affirm, that all the buildings we *have* specified are of first rate merit; on the contrary, we freely acknowledge, that several of them required to be looked at with a somewhat indulgent eye, their chief merit consisting in their being embellishments to their respective sites. It is enough for our present argument, that compared with an equal number erected in the last century, the superiority will be found to be greatly on their side. And if of so many buildings that have risen up almost simultaneously, even no more than a minority will satisfy the fastidious critic, we may be tolerably content with what has been done, and look forward without despair at the future.

ON THE SELECTION OF THE CLASSICAL STYLE OF ARCHITECTURE FOR BUILDINGS OF NATIONAL IMPORTANCE, AND THE VARYING OF THE CHARACTER OF SUCH BUILDINGS SO AS TO MARK THEIR DESTINATION AND USE.

By A. W. Hakewill, Esq., Architect,

Member of the Architectural Society of London.

Of all the arts the pursuit of which tends to promote the comfort and dignity of a nation, that of Architecture is the most conspicuous; and progressing as it does in intimate connexion with the other arts of civilization, it may be considered as affording a fair criterion of the wealth, capacity, and taste of a people. Architecture affects more or less all ranks of the community, from the highest to the humblest individual in the state,—the taste of all is influenced by the spirit manifested in buildings; the physical and moral comfort of all are improved by a skilful disposition of plan, and suitable choice of architectural detail. The welfare of such an art must then appear to be of vital importance, and hence the necessity of conducting it upon correct principles.

The object proposed in this paper, is the consideration of Architecture as a fine art, and as having thereby a tendency to strengthen the moral influence of a nation, by exalting the character of its institutions, and shedding grace and dignity over the land.

Taking this view of the art of building, the propriety of selecting the most beautiful style for national purposes will be readily conceded. Fortunately for the result of this question, the truly beautiful in art is not an arbitrary affair, which must necessarily vary in character with every change of society, amenable to no laws but those of fashion; but certain and defined, based upon principles at once eternal, and of the most exalted character, those exhibited in the human form.

The scope of fine art is to affect the mind strongly and lastingly, with a view to raise in it admiration for the nobler virtues: the human form is the element with which it works to effect this lofty purpose; no other object in nature would so immediately conduce to it; for setting aside all consideration of the quick sympathy excited in us by the contemplation of our own species, it is of all others the most winning upon the mind, from the combination it presents of the highest sentiment with the most graceful flow of line—the union of the utmost moral and physical beauty.

The full power of the human form was keenly appreciated by the Greeks, who were thereby induced to seize every occasion of displaying it in connexion with their architecture. Art as treated by the Greeks,—let us not call it Greek art, for their style, the most refined, may be equally that of all nations, based as it is upon principles unchanged and unchangeable;—art thus treated, that is, rendered independent of local circumstances, such as climate, laws, and customs, becomes by the intelligible character which it thus acquires, comprehensible to all, equally expressive in all times and places, and so extends its sphere of utility, acquiring thereby the title of *liberal;* thus widely differing from local art, which, indifferent to the portrayal of sentiment and passion, aims at the mere representation of the reigning fashions, displays man their victim, and so renders him an enigma in the eyes of posterity.

The remains of Greek sculpture afford a striking exemplification of the enlightened mode of treating art: in the Parthenaic frieze, for instance, the sculptor, penetrating into the philosophy of his pursuit, which consists not in servilely representing a scene, but in presenting to the beholder objects of high interest, has given us the *beau ideal* of the human race, and by gracefully casting aside the garments, has, in thus yielding to nature her rights, blended truth with his subject, and so invested it with real dignity.

It is owing to the ample instruction afforded through the medium of the classic style of art, that the remains of Greek and Roman antiquity are treasured up by nations, whilst those of the middle ages and other epochs find favour only here and there in the eyes of lovers of curiosities.

Architecture, to possess true sublimity of character, should combine with painting and sculpture, and to form an harmonious union with those arts, must derive its origin from the principles upon which those arts are based; and since the study of the human form constitutes the essence of painting and sculpture, so must it in some way necessarily form the basis of the beautiful in architecture. Such a system as that sought for, have we received at the hands of the Greeks, a nation chosen it would seem to direct our mental vision towards the sublime, in all those arts, the pursuit of which so exalts and dignifies the social state.

In investigating the system of architecture practised by the Greeks, we trace its origin to the study of the human form; for whilst we perceive that the mouldings, those parts that give life and movement to a building, are composed of lines analogous to those that bound the human body, we are made sensible that the contemplation of no other object in nature could have built up in the mind so exquisite a system of proportions as that manifested in the three Greek orders of architecture. Their aspect fills the mind with delight; they exhibit no exaggerated quality, but rather rivet attention by the display of a well-poised combination of many excellences, all tending, under the guidance of marked propriety of thought, to the realization of grace and dignity.

So beautiful are the details and proportions of the orders, and so complete are they in every respect, that a conscientious study of them forces upon us the conviction, that architecture with the Greeks, far from being the primitive art, was on the contrary the last production of the mind—of the mind enriched with notions of *the beautiful*, imbibed through a zealous devotion to the study of the human figure, and ardent research into the truths of geometry; for if we consider it otherwise, and that architecture took the lead in the progress of Greek civilization, we are left in the dark as to the source of its impressive beauty; but viewing it, as it has been already remarked, as *the result* of mental refinement, we can account for the beauty and accuracy of thought displayed in the orders, which we hail as the legitimate and graceful offspring of art and science.

The enlightened thought manifested in the architecture of the Greeks has won for it the appellation of classic, in contradistinction to other styles, in relation to which it may be said to stand as does man to the rest of the animal creation, for in Greek architecture we have the manifestation of the beautiful, the *beau ideal* in the art of building; the result of the most refined and exalted taste, the classic style is alone applicable to the lofty purposes of art, and is invariably found to be chosen for such occasions by civilized nations, whenever public opinion upon the subject is allowed sway.

The classic style recommends itself moreover, through its great susceptibility of modification, a quality essential in the architecture of a nation actively engaged in developing their mental resources. Beauty and invention, the scope of classic architecture, its natural tendency is to advance. Unfettered by the consideration of dates, epochs, fashions, and peculiarities connected with a limited state of civilization, he who cultivates the beautiful style finds it ever fruitful with resources at the juncture of novel circumstances, and ready to unveil new features as necessity demands. Unlike other styles which constantly refer the artist to some remote and obscure period, keeping his attention *chained* to that which is already invented, the classic style by affording through its free unshackled nature the amplest facility for the illustration of mental improvement, prompts invention and bids man progress;

therefore is it selected by nations seeking honour in the career of architecture as their only efficient weapon in the intellectual contest. As an instance of the resources of the beautiful style of architecture, the modern cupola may be cited, of which England possesses so admirable a specimen.

The next care, after selecting a style of architecture for buildings of national importance, is so to vary it as to impress each building with an appropriate character. Character is the soul of art, and the necessity of making a particular study of it in architecture will be apparent on considering the nature of the art itself. Architecture is the landscape with which civilized man surrounds himself. When man, abandoning a roaming life, settles in a particular spot and forms therein a community, he bids farewell to numerous beautiful objects of nature, substituting in their stead those of art. With the marked individuality of character as well as variety manifested in the objects of nature, all are struck; it therefore becomes of paramount importance that we should preserve this attribute in the works of our own creation.

Nothing tends more to the proper training of the mind than the contemplation of objects possessing a decided and fit character; he, therefore, who undertakes to design buildings, contracts a heavy responsibility with his fellow-beings, as there are few objects of equal importance which come so frequently under their consideration.

Character in works of art indeed generally presents itself under two points of view—positive character and its gradations. To particularize, a prison will necessarily possess a stern character; but a prison built in an age of barbarism and tyranny, and in which the fine arts have little or no existence, will present a far more forbidding and repulsive aspect than one built under more favourable circumstances, as that of Newgate for instance. To the lasting honour of Dance be it remembered, that he conceived the true character of a prison built in an enlightened and civilized epoch. The subdued severity of the building softens the character of the institution itself, proclaiming it to be maintained for the protection of society, not for the oppression of man: in it we are in no way reminded of a bastile; the science of the architect, the philanthropy of the Christian, go hand in hand in this composition, in which the graceful and severe are happily united; with the dread avenging spirit is blended the god-like characteristic of the merciful, allaying to a great extent the oppression created in every feeling mind by the contemplation of such buildings, and suggesting the probability of a humane treatment of the unfortunate inmates.

For felicity of expression, St. Paul's Cathedral stands unrivalled amongst the buildings of its order: it announces itself as a temple erected to the Divinity by a powerful and enlightened nation; its sacrificial and propitiatory character would seem to manifest the gratitude felt by our ancestors for the many blessings vouchsafed by Providence to the inhabitants of this portion of the globe, and their full sense of the awful responsibility resulting from that sway which it was granted to them to exert amongst the nations of the earth. Composed as this building is, of elements frequently applied prior to its erection, we admire the way in which the artist has escaped from the shackles of precedent; but the grand original conception flows, in this instance, from the only true spring whence man can hope to draw forth thoughts worthy of such great occasions—from a mind impressed with the grandeur of Nature's works, and exulting in the omnipotence of their Author. Of the truth of this we are made sensible, our minds becoming tuned into harmony with these sublime considerations as we gaze upon the building.

In Greenwich Hospital, we behold a building not less celebrated for the character it displays, than for the profound knowledge which it exhibits of the rules of art. It is but a hospital, though possessing a most palace-like appearance; but the English know well how to tolerate in this instance the elevation of style.

The Roman critic, Milizia, says, remarking upon this building, "that the world is at once reconciled to the sumptuosity of this hospital, upon reflecting that it is the asylum of the bravest of the brave—the British mariner; that it is a monument erected by a nation, sensible of what it owes to those who have maintained her triumphant and free." If we are delighted at the magnificence and convenience of this design, we are no less inclined to admire the bias of that mind, which could, whilst creating, pay such deference to accessorial circumstances, and thus appreciate the merits of the surrounding and distant landscape.

Greenwich Hospital is admirably fitted to its position. It would seem, that nature wooing art in this beautiful region, art had unfolded its various powers to pay homage to the loveliness of nature, willing to receive great part of its lustre from so sweet a union. Which of the principles predominates, it is not easy to determine; it is most true that the principle of art forms first of all the chief motive of attraction, but it must be confessed with the apparent intention of directing the vision to the distant upland scenery upon which the eye so luxuriantly reposes. Seated amidst the beauties of nature, Greenwich Hospital seems designed with a view to their embellishment, just as a fair hand or neck receives additional lustre in our eyes through the agency of some graceful ornament.

Happy were it for us as a nation, did our public buildings manifest more frequently than they do, the same intelligent spirit: that we of the present generation may have to applaud similar discrimination and taste in the erection of public buildings now under consideration, must be the ardent wish of every genuine artist and true lover of his country. May it therefore so happen, that those who wielding the destinies of this great empire have its talent at command, may exercise such judgment in directing it, as to preserve for us the character of an enlightened nation, and maintain the national honour. We are the more disposed to lay some stress upon this; for let it not be supposed, as it might be on a prior consideration, that where apt sentiment is not perceived in buildings, the want of it is always to be attributed to the architect; for this to be the case it is essential that those who control him in the first instance, should be penetrated with the true importance and dignity of his art, and the value of the artist's own studies; where this is not the case, the architect will be subjected to ignorant and discouraging interference, precluding all hope of the proper termination of his labours.

Were an instance sought which might stand as an example of misrule in the affairs of architecture, we should cite a building lately erected, still known by the appellation of the "National Gallery," which fails to possess real fitness of character in the same ratio as the above-mentioned buildings abound in it.

The dignity of the art itself, the importance of the subject, the value of the architect's own studies, have all been lost sight of in this instance. Had the importance of the subject been duly appreciated, a less inconvenient spot could have been selected for the erection of the building; in the present instance an excessively narrow piece of ground has been allotted to a building the destination of which precluded great altitude. This latter disadvantage might have been combated had the architect been able to make a receding front, with a court faced towards Charing Cross by a screen; the play of outline, the variety of light and shade, would then have contributed their share to grandeur of effect, to say nothing of the greater convenience resulting from such a disposition. But the architect has been prevented adopting this plan by the existence of buildings in the rear of his own, such as the barracks and workhouse, and of great importance too it would seem in the eyes of his controllers. Of so much importance were they deemed, that the architect was actually crippled in his design for a "National Gallery," by the necessity of providing additional entrances for the use of those buildings: whence he has been compelled to cut gangways through the façade on either side the portico, thus destroying that repose and severity of outline which, in an architectural point of view, formed the only resource left him by the unaccommodating nature of the ground.

Moreover, for a sum inadequate to the purposes of a "National Gallery," the architect has been compelled to unite with it the distribution and requisites of an Academy of Arts; and the lamentable parsimony manifested in this undertaking has been carried to the extent of suggesting the wretched expedient of introducing features of a demolished building, which, having been scraped and made to look new, their true proportions altered, have been, in defiance of all principles of harmony, and deference to the architect's own conceptions, forced into the design. No money has been allowed for sculpture of an appropriate character, which would have given expression to the building; and so little understanding of the nature of architectural embellishments has been manifested, that with a view to trick up the building, and make it effective at a cheap rate, ornaments ready at hand and of a character however irrelevant to the subject were made use of in the first instance, and the good sense of the public was for awhile outraged by the absurd spectacle of a monument to the peaceful arts bearing on its front works commemorative of war and strife.

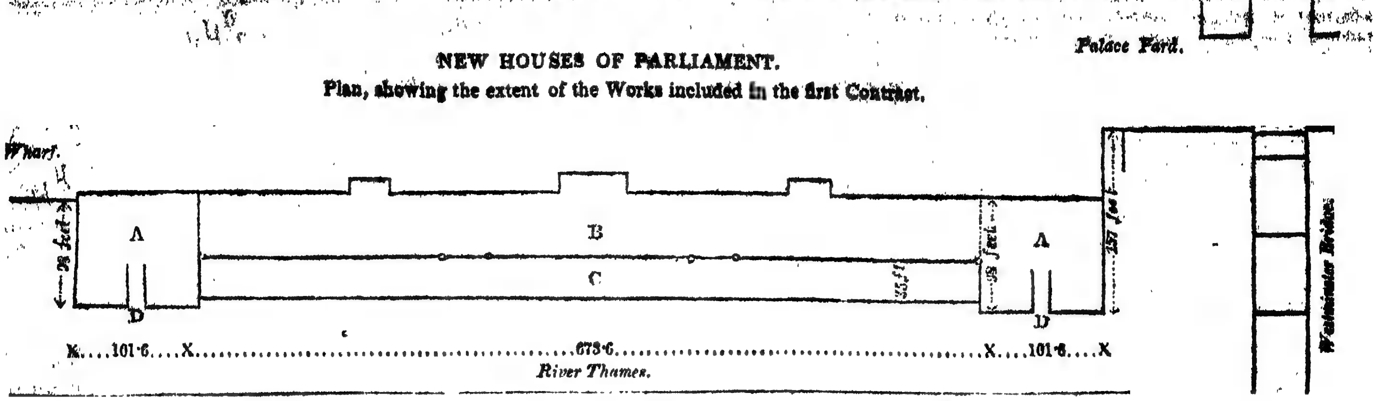
When we consider the source whence this building springs, from a nation ranking amongst the wealthiest and most powerful upon the face of the earth; and the object to which it is destined, one of the most exalted and beneficial to society that man in all the extension of his mental powers can uphold—the fostering and promoting the polite arts, which he recurs to at the cessation of anarchy, darkness, and brute force, as to the highest privileges of his mind;—when we view the "National Gallery" in connexion with these thoughts, its insignificant appearance becomes in the last degree humiliating to our national feeling; we feel that by it the arts are dishonoured, that the term national is burlesqued.

All that can be urged in favour of the building is, that though devoid of character, and wofully bald, it is not altogether destitute of grace; that what ornament it possesses is well executed, and that it displays the elements of taste in a sufficient degree to authorize the belief, that the artists engaged upon it would have produced grandeur, had they been but fairly treated: this it appears to us is the utmost favour that the most candid criticism can extend to the subject.

The ample means however of consolation afforded to us by numerous private buildings lately erected in London, prevent our lamenting long over this unfortunate affair. To a few of these we now beg attention, imagining their merits to be of that high order which should secure for the art itself the solicitude and generous encouragement of those whose exalted stations in the service of their country give them presidency over its various sources of honour and commercial profit:—First, then, that masterpiece of architectural composition, which shines so brightly by night as well as day, Hanover Chapel in Regent-street, in which beauty and convenience are united, and a sacred character preserved; the graceful portico and atrium of the Chapel in North Audley-street; the Travellers' Club, Pall-mall, in which the playful and the severe of the Italian style are happily elucidated; much of the lately erected interior of the College of Surgeons; the Bank of England, a building teeming with beauties of the highest order. It will scarcely, we think, be denied, that these buildings prove that the admirable feeling for architecture which displayed itself two centuries since, still exists amongst us; and that, with the co-operation of the Legislature, as circumstances occur to bring this feeling into play, there can be little fear of England's derogating from that high position in the art which her former brilliant achievements in this field of intellectual exertion have won for her, with the consent of all civilized nations.

NEW HOUSES OF PARLIAMENT.

Plan, showing the extent of the Works included in the first Contract.



A Esplanade B Site of New Building A Esplanade
D Stairs C Terrace D Stairs

The first contract for the commencement of the works was entered into at the beginning of last month: the works are to be executed under the joint direction of Messrs. Walker and Burgess, Civil Engineers, and Charles Barry, Esq., Architect. Messrs. Lee are the contractors; amount of tender reported at 73,335*l*. The works to be done under this contract are most important in regard to construction; they comprehend the formation of an embankment 876 feet in length, projecting into the river 98 feet beyond the present embankment; the front will be in a line with the inner side of the third pier of Westminster Bridge, in four feet of water at low tide: the whole to be surrounded by a river wall, 30 feet high from the base, and 1,141 feet in length, with a curvilineal batter, and faced with granite. A terrace 673 feet long next the river, and 35 feet wide, is to be formed in the front of the new Houses, with an esplanade at each end 100 feet square, and landing-stairs from the river 12 feet wide. The foundation wall of the front of the new building, the length of the terrace, and 30 feet high, is included in the contract; also the whole surface of the front building, which is to be excavated and filled in with concrete 12 feet thick, forming a permanent and solid foundation for the superstructure. A coffer-dam is to be made surrounding the works, 1,236 feet long and 10 feet wide, before they can be commenced.

The following are the particulars of the construction:—The *coffer-dam* is to be first made by dredging a trench in the bed of the river, in the form of a segment of a circle, 27 feet wide, and 8 feet deep in the centre, which is done to allow of the piles being driven the more easily; two parallel rows of guide or main piles of whole timbers will then be driven at five feet apart, leaving a width of nine feet between them transversely; to these piles will be fixed three tiers of waling of whole timbers, cut down and bolted together, one tier to be fixed at the top on a level with high-water mark, another level with the bed of the river, and the third midway; the piles and waling are then to be bolted across with iron bolts 12 feet long, forming a carcass for the inner or sheet piling; the inner main piles will be firmly braced to resist the thrust and pressure at high-water; the whole of the piles are to be 36 feet long, to be driven through the gravel and two feet into the clay substratum, which is twenty-eight feet below high-water mark: within the waling will be two parallel rows of sheet piling, the outer or river side will be of whole timbers, and the inner or land side of half timbers. After all the piles are driven, the gravel forming the bed of the river between the piles will be excavated down to the clay, and the space between, 34 feet high and 5 feet wide, will be filled in with clay and puddled. There will be fender or guard piles at 10 feet distance from the coffer-dam, with floating booms to prevent craft running against the works. After the coffer-dam is complete, the bed of the river will be excavated the whole length of the river wall, 39 feet wide and 12 feet deep, to form the terrace; the front and inner wall will be 24 ft. 9 in. high, standing on a course of concrete 1 foot thick, upon which will be bedded two courses of 6 inch stone landings; the lower thickness of the wall will be 7ft. 6 in., and the top 5 feet, with counterforts 16 feet apart, 3 ft. 9 in. wide by 3 feet 4 deep; the back of the wall will be carried up perpendicular, and the front will be faced with granite, laid in horizontal courses 2 feet thick, with bondstones 4 feet thick and 6 ft. 6 in. apart; the face of the granite will form a curvilinear batter of 2 ft. 6 in. in 22 feet. At 30 feet distance from the inside of the river wall will be built the front wall of the new building, which is to stand on a foot of concrete, with two courses of 6 inch stone landing; the lower part of the wall will be 6 ft. 4 in. wide, and the top 4 ft. 6, and 24 ft. 9 high. Between this wall and the river wall a space, 30 feet wide, 673 ft. 6 in. long, and 27 feet high, will be filled in solid with concrete to form the terrace; the foot of the river wall will be protected by sheet piling of whole timbers 8 feet long, with a waling along the top bolted with iron bolts, 6 feet long and 4 feet apart, with screws and nuts let into the stone-landings of the footings; the river wall to the front and side of the esplanade will be 1 ft. 2 in., and 2 ft. 3 in., thicker than the terrace wall; and the whole surface of the esplanade will be excavated and filled in with a solid bed of concrete 20 feet thick.

In a future Number we will endeavour to give the principal quantities of the materials, and further particulars.

LONDON WATER COMPANIES.

All the Companies are expending enormous sums of money for improving their supply of water in the metropolis. The *Grand Junction Company* are expending a sum that cannot be far short of £200,000; they are erecting extensive works at the entrance of Brentford, under the direction of —— Anderson, Esq., for the supply of water from the river Thames, on the south side of a small island about 400 yards above Kew Bridge, where there is an excellent stream of pure water. The works commence in the centre of the stream; about 4 feet under low-water mark is an immense cast-iron semi-cylindrical chamber, with a grating to the front 10 ft. 6 in. long, and 3 ft. in. high, flat on the top and under side, which is bedded in the bottom of the river by means of the diving-bell. Branching from and connected with the cylindrical back, is a cast-iron conduit or pipe 3 ft. clear diameter, which is laid horizontally 3 to 4 ft. below low-water-mark, and continued on towards Kew Bridge, turning round the island, and crossing the other arm of the river to the bank on the north side. The first portion of the pipes is laid down by the diving-bell, and the other part by forming a coffer-dam, equal in length to three of the conduit. The joints are very ingeniously and simply executed; the pipes have a spigot and faucet joint: round the outer rim of the spigot is cast a narrow and thin collar, which is turned in a lathe rather conically; so is the interior rim of the faucet; both surfaces being ground perfectly true, they fit into each other, and form a perfectly secure water-joint, without any assistance of packing, lead, or other material; and to prevent the pipes from coming apart, there are two eyes cast on the rim at each end of the pipes, which are connected by means of two nuts and screw-bolts—thus the pipes can be very expeditiously connected under water by means of the diving-bell, or in the coffer-dam. From the banks of the river, the conduit is built in brick and cement, and continued across the wharf and under the road to the opposite side, where it terminates in a shaft or well: to this point the water flows from the river, as the whole of the conduit is laid horizontally and under low-water mark: connected with the shaft is a four way cast-iron chamber; one of the apertures is closed, the other two, at right angles with the conduit, are furnished with two sluice cocks or valves, 42 inches diameter, which shut off or open a communication with two wells under the engine pumps: here the water is to be pumped up by means of four steam-engines, which are being manufactured by Messrs. Maudslay and Field; their united power will be equal to 500 horses. Two engines only are to be worked at one time, which are to raise the water to supply the Company's reservoirs at Paddington, a distance of six and a half miles: for this purpose it will require 4,000 lengths of cast-iron pipe, in lengths of 8ft. 6in. to 9ft., and 2ft. 6in. clear diameter, of inch metal, weighing from 29 to 30 cwt. each: they are to be connected by spigot and faucet joints run with lead (about 1 cwt. required to each joint); the cost of the pipe, including lead, laying, removal of surplus ground, and making good the roads, is estimated at £8. *per yard*: each pipe is proved by an hydraulic engine before it leaves the wharf, at 160lb. pressure on the square inch, which is equal to 11 atmospheres. The elevation of the reservoirs at Paddington is about 86 feet above the works at Brentford, consequently there will be an hydraulic pressure of about 36lb. per square inch on the pipes at the ford end. At Paddington the water will flow into the Company's r when it will supply, by means of their present engines, the different parts of the Metropolis which is within their division.

The *West Middlesex Water Company* are laying down a conduit similar to that of the Grand Junction Company across the river Thames, from their works at Hammersmith to the opposite side of the river, where they formed reservoirs covering many acres of land for receiving the water the river, and allowing it to deposit any impurities it may contain, and filtering it before it be conveyed into the pipes or conduit across the T

The *Chelsea Waterworks Company* are also about to lay a sim across the river Thames, from their works at Chelsea to the opposite side, where they will form extensive reservoirs in Battersea Fields, House.

sinking a well at the foot of the Hampstead Road to a considerable depth, and of large diameter; the upper part for a few feet is steined in brick set in cement, and the

is formed by cast-iron cylinders, each length gradually diminishing in diameter, so that the under one may pass through the upper one successively, similar to a telescope-tube; the iron cylinders are made perfectly water tight, to prevent the land springs impregnating the water in the well: after sinking the well to a considerable depth, they commence boring, which will be continued until they come to the pure soft spring-water of the chalk stratum, which is supposed to lie about 300 feet below the surface.

The *East London Company* are about to erect a new engine-house, and have one of the Cornish steam-engines, equal in power to all their engines combined.

STEAM NAVIGATION.

We have inspected the new steam-ship fitting out for conveying passengers between London and Hull, named the *William Wilberforce*, lately launched from the building-yard of Messrs. Curling and Young, at Limehouse. We do not remember having seen a finer or more perfectly formed steam-ship afloat; her length over all, exceeds 200 feet, and her extreme breadth athwart the paddle-boxes 46 feet. When we inspected her, the draught of water was only seven feet six inches, but without coals, or water in the boilers.

We were much pleased with her engines, manufactured by Messrs. Hall of Dartford, which are now being fixed on board in the East India Dock: we understand that they are the largest marine engines that have been put on board any vessel in the river Thames, and are only second in size to the engines which are now being manufactured for the new steam-ships building for the American trade; each of the engines of the *William Wilberforce* is of the computed power of 144 horses, having a stroke of six feet, and paddle-wheels 24 feet in diameter, and eight feet six inches wide. The two foundation plates upon which the machinery stands, are each 26 feet long, and 5 feet 9 inches wide, with deep feathers or flanches, and condensing chambers, all cast in one piece, and weighing between 11 and 12 tons. The forged work of the shafts and cranks are excellent, and from their magnitude such as could only have been accomplished by machinery, powerful as that possessed by the house that supplied them, the Messrs. Acraman, of Bristol. The engines are provided with three cylindrical boilers, 25 feet in length, with interior cylindrical tubes or flues, the whole complete weighing between 50 and 60 tons. The chimney is of novel construction, being enclosed in a jacket, forming an air-tight casing throughout its entire height, the space between the funnel and casing serving the twofold purpose of receiving the surplus steam from the safety valves, and thus dispensing with the ordinary waste steam-pipe, and of keeping the interior of the chimney at a high temperature, and thereby increasing the draught through it without that excessive and unsightly enlargement of its dimensions which would have been necessary on the ordinary construction. It also prevents the possibility of the sails or rigging of the vessel coming in contact with the chimney. The total weight of the boilers, engine, water, and compliment of coals for the voyage, is estimated at 310 tons. We should have stated, that the engines, besides being provided with every precautionary contrivance against fire, bursting of boilers and other casualties, are also fitted with Mr. Samuel Hall's (of Basford) patent condensers, which have been in successful operation in the *Hercules* and other steam-ships for nearly two years, and have fully answered the important purpose intended—that of supplying the boilers of marine engines with pure distilled water instead of salt or muddy water, which on the ordinary plan is unavoidable; by which process the internal parts of the engines are not exposed to the corrosive effect of the salt injection water and salt vapour as with the common injection engine, and thus their durability as well as that of the boiler is greatly increased, while a more perfect performance of the engines is obtained with a diminished consumption of fuel.

For a view of the engines, we are indebted to Mr. Francis Humphrys, under whose able direction they have been constructed. Mr. Humphrys also exhibited to us a model of an ingenious invention which he has lately made, for obviating the possibility of marine boilers being deficient of water; or of their injurious expansion by the sudden shutting off the steam from the cylinders, so frequently occurring in navigating the river, or in going in and out of harbours, which causes serious injury to the boilers by straining the rivets, and opening the joints of the plates. The apparatus also renders explosion from under pressure next to impossible; we shall at some other time give a description of this important appendage to steam boilers.

We wish the spirited proprietors of the *William Wilberforce* (the Humber Union Steam Company) the full measure of public support, so justly due to them for their liberal and meritorious efforts in providing this costly example of British skill, which we believe will be found to combine every improvement capable of imparting safety and celerity to the ship, and confidence and comfort to the passengers.

The *Great Western* steam-ship has just come into the East India Dock to have her engines put on board; her build is of beautiful proportions, with a round stern. She was built at Bristol; her tonnage is calculated at 1,300 tons; she is to have two marine engines of 200 horse power each; the cylinders are 73½ inches diameter; and she is to have four boilers. She is intended to trade between London and New York.

The *Victoria* steam-ship, now building by Messrs. Curling and Young, is the largest steam-vessel built in this country, and is intended for the same trade as the *Great Western*; her length on the water-line 230 feet: she draws, when unloaded, 11 feet; when loaded, 15 feet; breadth of beam 40 feet, depth of hold 28 feet; breadth, including paddle-boxes, 69 feet; her tonnage is estimated at 1,800 tons; she is to have two steam engines of 230 horse power each; the cylinders are 78 inches diameter, paddle-wheels 30 feet diameter. Estimated to cost, including her engines, £100,000.

SIGNALS ON RAILWAYS.

Sir,—In consequence of the numerous accidents daily occurring upon railroads, I have considered that they might be in great measure averted by the following plan; possibly some part of the scheme may have been suggested before, but I trust, under the present circumstances, you will consider it worthy of insertion in your Journal.

I propose that a series of masts, 50 or 60 feet high, be erected on the most prominent situations, not exceeding one mile apart, and flags of different colours hoisted to various heights, and worked by the railway police, to notify any communication, stoppages, or accidents, which may be transferred from one part of a railway to another with the rapidity of a telegraph; and various signs or flags might also remain stationary, as signals to the engineer of the locomotives, when it is necessary to slacken speed, or stop, which may be seen at a much greater distance than the signals at present made by the police: a portable mast might be constructed, to be placed in situations where there was danger, repair, or stoppage. At night, a lamp with a bright light should be placed at the top of the mast, and if any signal be required to be made, another lamp with coloured glass should be hoisted to a certain height, and by keeping the lamp burning at the top, the comparative height of the lower or signal lamp would be more easily distinguished. There should also be fixed a large bell, that signals might be given in hazy or foggy weather, which should be kept constantly ringing when any accident has occurred, until it be answered by the next signal, or the train has passed; probably a gong would be a better substitute for the bell, to prevent mistake from the sound of church bells in the neighbouring towns and villages. Numerous minor arrangements might be made to make the proposed signals efficient and useful.—W. L.

CONTRACTORS' GRIEVANCES.

Sir,—In your address or prospectus, you signify that your Journal is to afford a medium of communication to all parties in any way connected with the profession; as such I hope your pages will be open to the exposure of any abuse of grievance which may be pointed out as having crept into the profession, no matter from what quarter it may come. I am a builder, and believe I have executed as much work as any contractor in England, and am still continuing to do so—the first grievance I have to complain of is the introduction of a new clause into the conditions of specifications, which throws upon the poor builder the whole onus of the failure of construction, no matter from what cause. I do consider that if an engineer or architect be employed, that responsibility should be his; but if it be on account of inferior materials or workmanship, then let it fall upon the builder. Another grievance I consider equally deserving of notice is, that in several large railway and bridge contracts, lately entered into, there has been omitted the design of the centres where the arches are of considerable magnitude, and also the construction of the foundation has been left in a state of obscurity. I do submit that the centre should be subject as much to design and specification as the arch itself, and ought to be as clearly drawn and explained as any other part of the work; and that the foundation should be most particularly described, as the whole building depends upon its security. There are other grievances that I would wish to point out, which I will do at a future time, and conclude by trusting that the profession may not consider me intrusive by making these few observations, and wishing your new work every success.—A CONTRACTOR.

PROGRESS OF RAILWAYS.

Southampton Railway.—Considerable progress has been made within the last three months in the works between London and Kingston, the heaviest part. The embankment across Battersea Fields is in a very forward state; it is now within half a mile of the terminus at Nine Elms. A powerful locomotive engine is employed for removing from 40 to 50 waggons in one train, each loaded with about three cubic yards of soil, taken from the cutting on Wandsworth Common, a distance of about three miles. We have no doubt that the works under the active management of their present Engineer, J. Locke, Esq., will be completed within the time, and for the capital, last reported—we are only surprised that the shares of this Company remain at the heavy discount they do; we have always considered, and still are of the same opinion, that it will be the best passenger line coming into London, and will pay better than any other line in proportion to the capital expended. It is the terminus at Nine Elms which is most against it; they should push the line on to the City, they would then be able to monopolize all the traffic of Wandsworth, Tooting, Richmond, Hampton, and the villages in the vicinity, which they will not do unless the line be extended. Although the short steamers are a great convenience on the river Thames, still the passengers do not want to be danced in and out of half-a-dozen conveyances; besides the delay occasioned by the steam-boats, which cannot convey passengers from Nine Elms to Blackfriars Bridge, including embarking, much within thirty minutes, which might be accomplished by a railway in six minutes: we advise them well to consider of the extension before it is too late. We highly approve of the Company delaying opening the line until next spring, although the works will be ready much sooner; we consider the Directors and Shareholders highly reprehensible, of those companies that so eagerly open their railways to the public before the embankments have had time to consolidate; railways have quite enough to contend with, without the companies creating prejudices against them on account of the frequent accidents and delays that we see reported in the daily papers.

Great Western Railway.—The company are drawing pretty freely on the shareholders, but they are pushing the works very rapidly between Paddington and Maidenhead. Three or four contracts have been advertised last month for the works to be done to the Box Tunnel; we fear they must be undertaken by the company, although we are averse to this mode of proceeding; but the works are of so heavy a character, that we doubt whether they will be able to get responsible contractors to grapple with the undertaking without ...

Birmingham Railway.—The extension line between Euston-square and Camden Town depôt, is now worked by the stationary engines at Chalk Farm, which draw the trains from Euston-square, a distance of one mile, in three minutes and a half, by means of a large rope, which runs on cast-iron grooved pullies about eighteen inches diameter, let into cast-iron boxes, and firmly secured in the ground in the centre of each line of railway; where the line curves, they are canted a little on one side, to allow the rope to follow the direction of the curve. The company talk of opening a further portion of their line, about eight miles and a half, to Tring, on the 10th instant: they had better not be too precipitate; let the embankments be more consolidated; a few such slips as they have had on a portion of their embankment near Watford, may cause the *coroner* to be called into service; the consequences might be serious to some of them. The directors must recollect they have a responsibility which they owe to the public as well as the pockets of their subscribers. What is the reason they allow so many complaints to be continually made relative to the annoyance to the passengers, from the sparks escaping from the chimneys? We hear of no such complaint from other railways; we have just received a letter from a professional friend, who took a trip to Box Moor: he says, "I would not go again for a trifle; I am almost blinded with the ashes; it was the vilest ride I ever had."

Eastern Counties Railway.—Considerable works are going on in the neighbourhood of Old Ford and Bow; a bridge is nearly finished over the river Lea, of one semi-elliptic arch. The span is 70 feet, and the rise one-fourth; the arch is turned in 10 half-brick rims; the centre 12 feet, or crown of the arch, is built in cement; the whole is turned with marl paviors. Another bridge or viaduct of five arches, each 30 feet span, is building near to the above, besides four or five other bridges, under the direction of John Braithwaite, Esq.. Engineer.

Northern and Eastern Railway.—The company are now making a stir, and intend to commence operations, from the London terminus, and proceed to Broxbourn; this portion of the line which will pay them well, they intend to finish first, before they proceed to any other part of the line: *this is a wise proceeding*, and far better than that of some companies, who struggle over the whole line at once *to make a show*, and finish none; it is decidedly best to commence at the terminus, if near a large town, and proceed to finish a short distance of 10 or 15 miles, which may be brought into working condition and pay the shareholders for the capital expended, and then go on again.

The Croydon Railway.—The arches adjoining the junction of the Greenwich Railway are built, and the bridge is now building over the canal—span of arch 40 feet, rise 10 feet, turned in 10 half-bricks set in cement. The works on the heaviest portion of the line (the cutting near Deptford) are proceeding feebly; the Company ought to put their whole strength on this portion of the line, and leave the works at Croydon Common for the present, which cannot be of any service until the above heavy cutting is finished.

Greenwich Railway.—This mill-stone moves very, very slow towards finishing; the directors *report*, that the remainder of the line is about to be proceeded with immediately: there must be some decidedly bad management somewhere. There are sufficient materials on the ground (excepting a few bricks) for finishing the bridge over the High-street Deptford, the bridge over the Ravensbourne Creek, and the viaduct between the High-street and the Creek; but there they lie, and we fear are likely to do, unless some fresh vigour is instilled into the directory.

The Brighton Railways are all aground; they made a regular hotch-potch mess of the line last Parliament, by bartering the best portion of the line to the South-Eastern Railway Company, under the most disadvantageous circumstances; if they wish to do any good, they must get rid of this untoward bargain; we advise them to look sharp, or they will have Cundy's line after all annoying them, probably more than they expect.

Birmingham, Bristol, and Thames Junction.—A contract has just been concluded for building the railway gallery, intended to pass under the Paddington Canal, which is to be diverted and carried over the gallery when built; the contract also includes the building a suspension bridge, or rather a tension bridge, over the canal for foot passengers. W. Hosking, Esq., Engineer. Messrs. Cubitt, contractors. Amount of tender near £8,000.

BUILDINGS AND PUBLIC IMPROVEMENTS.

A Church in the Italian style, with a bell turret, is now building in St. Andrew's burial-ground, in Gray's-inn-lane, under the direction of J. Pennethorne, Esq. The contractors are Messrs. Pearce and Guerrier. Amount of tender about £7,000.

A Church in the Gothic style is being built in the Kent-road, under the direction of Samuel Angel, Esq. Amount of contract about £4,000.

A Church is about to be built in the vicinity of Gough-square, in the parish of St. Bride's.

Two Churches have been contracted for in the parish of Islington. One of them to be built in the Grecian Order, in the Holloway-road, under the direction of Messrs. Inwood and Clifton: amount of tender about £2,000. The other Church is to be built in the Gothic style, with a bell-turret, and vaults, in the Caledonian-road, near King's Cross, under the direction of William Tress, Esq.; amount of tender under £3,200.

It appears by the above tenders that Church building is becoming more and more depreciated: it is impossible to give the Churches any character of architecture—the best is only a make shift. If the Commissioners go on lowering the amount of their allowance, we shall very soon have a new era and style of architecture, to be called "*The Commissioners' Barn-Church Architecture.*"

London and Westminster Bank.—A building in the Italian style, of considerable extent, is now erecting in Lothbury, under the joint direction of W. Tite, Esq. and C. R. Cockerell, Esq. Mr. Grimsdale is the contractor. Amount of tender between £16,000 and £17,000.

Serjeants' Inn.—An additional building has just commenced next to Chancery-lane, corresponding in character with the other buildings that are now finishing. Sir Robert Smirke is the architect, and Messrs. Grissell and Peto are the contractors.

Estimates are now in hand for building the Fitzwilliam Museum; the character of the building is to be Roman, with a Corinthian portico. George Basevi, Esq. is the architect.

Juvenile Prison, Isle of Wight.—The barracks, covering about 4 acres of ground, is in course of being converted into a prison for juvenile offenders. Sydney Smirke, Esq. is the architect, and Messrs. Baker are the contractors. Amount of tender under £20,000.

New Street from the Houses of Parliament to Pimlico. A survey is now being made of the property on the line; we are friendly to public improvements, but we think this is not required. If the Riding-school and the Royal Mews at Pimlico were removed, and two or three houses taken down, a direct line of road would be made in continuation of the King's Road, through Eaton-square, Pimlico, St. James's Park, Great George-street, to Westminster Bridge, and the New Houses of Parliament, which might be formed at one-tenth the cost of the other, and nearly the whole of the line, excepting the portion belonging to Government, is already formed.

Thames Improvement Company.—We have received a pamphlet by Dr. Granville, showing the enormous profit and advantage that might be obtained by saving the manure of the metropolis, which is now allowed to run to waste, impregnating the water in the river Thames, which many of us are compelled to swallow. We are decidedly friendly to any measure that will accomplish the object, and are of opinion that it is perfectly practicable, and ought to receive the strong support of Government. The promoters must be prepared to receive the sneers and scoffs of the public; we are sorry to say that all new improvements in London are generally ridiculed, and it requires the utmost patience and perseverance to carry them into effect.

The Arun Level.—A very able report has been made to the Commissioners of Sewers for the rape of Arundel, by John Macneill, Esq., on the present state of the river Arun, and the means proposed for the drainage of the adjacent country, together with estimates and tide tables.

A Suspension Bridge, with three openings of 700 feet span each, is about to be erected for the Austrian Government, under the superintendence of Tierney Clark, Esq., across the Danube, uniting *Buda* with *Pesth*, in Lower Hungary.

Blackfriars Bridge is undergoing repair, we may say rebuilding, under the direction of Messrs. Walker and Burgess. Two more piers are now surrounded with coffer-dams for the removal of the decayed stone-work, which is to be replaced with Bramley-fall stone; the centre of the bridge is to be lowered about three feet, and the balustrade and cornice are being removed, and instead, a plain parapet is being substituted with the cornice as before, made rather thinner than the old cornice, which we consider is not so well; the columns are being shortened, and the cut-waters raised, which is a decided improvement. It appears that the spandrells and top of the old arch are loaded with rubble, grouted with lime.

Westminster Bridge.—The repairs of this bridge are finished; most of the cut waters and piers have been refaced with Bramley-fall stone, and the top of the piles, which were exposed to the action of the water and the increased rapidity of current in consequence of the removal of old London Bridge, have been cased with stone. We understand that nearly the whole of these works were executed under water by the diving-bell; it has also been necessary to rebuild the facing of several of the spandrells, which bulged out in consequence of the interior of the spandrells being loaded with loose rubbish; every time a load passed over the bridge, the vibration was transferred through the loose rubbish to the spandrell. The works were executed under the direction of the Resident Engineer, F. Swinburne, Esq.

Bow Bridge.—A bridge is being built over the river Lea, under the direction of Messrs. Walker and Burgess. The voussoirs are now being turned; it is a single semi-elliptic arch, the span 70 feet, of Aberdeen granite.

LIST OF PATENTS GRANTED BETWEEN THE 28TH AUGUST AND 28TH SEPTEMBER, BOTH INCLUSIVE.

William Armstrong, of Hawnes, in the county of Bedford, Farmer; for his invention of "Improvements in Ploughs."—28th August, 1837; 6 months.

John Joseph Charles Sheridan, of Ironmonger-Lane, in the City of London, Chemist; for his invention of "Improvements in the Manufacture of Soda." 31st August, 1837; 6 months.

John Hanson, of Huddersfield, in the county of York, Leaden Pipe Manufacturer; and Charles Hanson, of the same place, Watchmaker; for their invention of "Certain improvements in machinery, or apparatus for making or manufacturing pipes, tubes, and various other articles, from metallic and other substances."—31st August, 1837; 6 months.

James Neville, of Clap Hall, near Gravesend, in the country of Kent, Civil Engineer, for his invention of "Certain apparatus or furnace for economizing fuel, and for more effectually consuming the smoke or gases arising therefrom, the same being applicable for the generation of steam, and for heating or evaporating fluids."—31st August, 1837; 6 months.

William James Gifford, of Gloucester-place, in the county of Middlesex, Surgeon; for his invention of "Improvements in Paddle Wheels."—7th September, 1837; 6 months.

Henry Vere Huntley, of Great Russell-street, in the county of Middlesex, Lieutenant in the Royal Navy, for his invention of "Improvements in apparatus for facilitating the securing of Ships' Masts."—7th September, 1837; 6 months.

Thomas John Cave, of Rodney-street, Pentonville, in the county of Middlesex, Gentleman; for his invention of "A great improvement in the construction of Paddle Wheels, applicable to ships, boats, and vessels of all descriptions, propelled by steam or other mechanical power."—14th September, 1837; 2 months.

Edmund Shaw, of Fenchurch-street, in the City of London, Stationer, for "An improvement in the manufacture of Paper, by the application of a certain vegetable substance, not hitherto used for that purpose;" being a communication from a Foreigner residing abroad.—14th September, 1837; 6 months.

Richard Davies, of Newcastle-upon-Tyne, and Robert Chrissop Wilson, of Gateshead, in the county of Durham, Earthenware Manufacturers, for their invention of "An Earthenware Tile Slab or Plate."—14th September, 1837; 6 months.

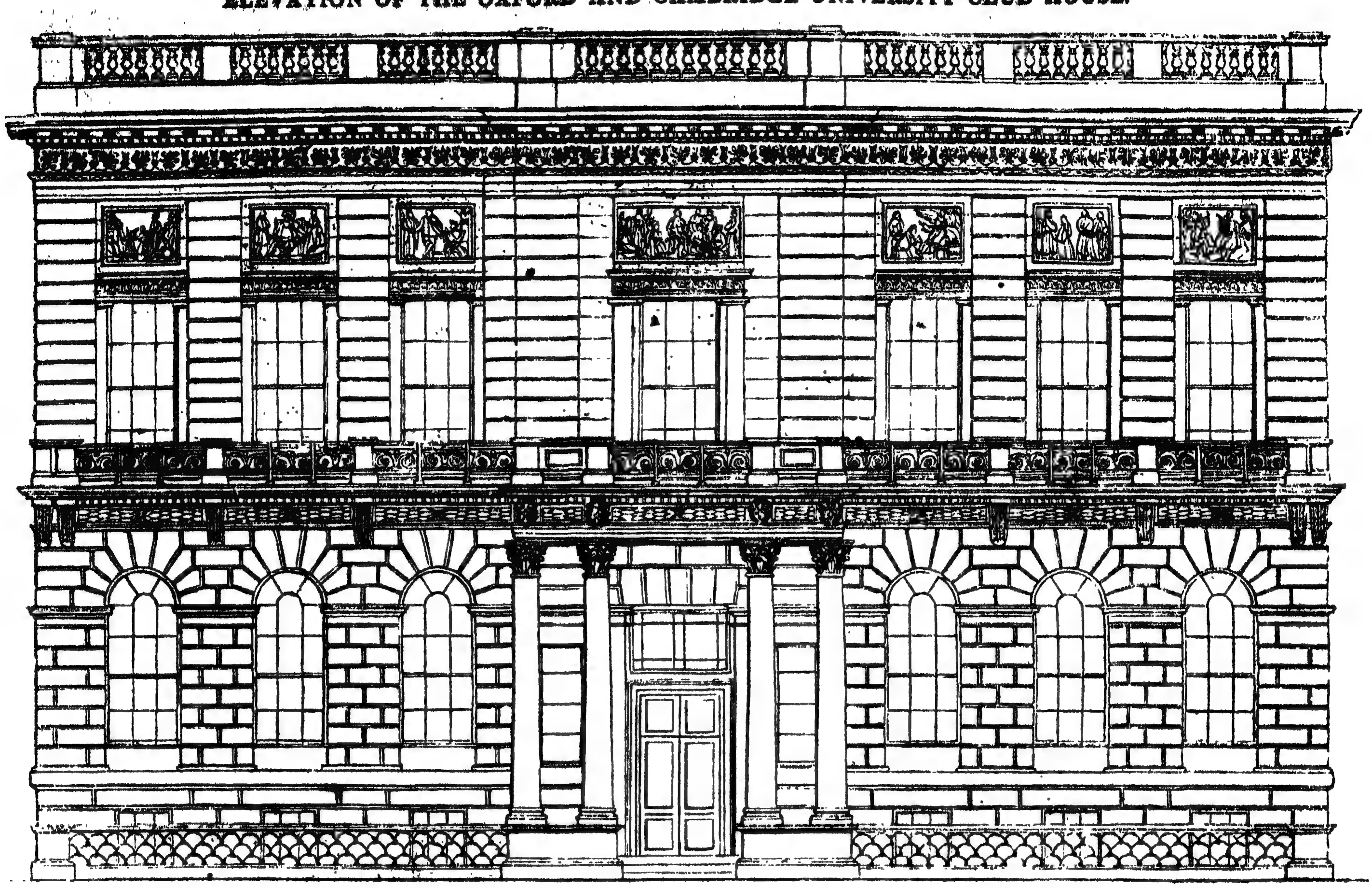
Nevil Sharp, of Bridge Wharf, Hampstead-road, in the county of Middlesex, Wharfinger, for his invention of "Certain improvements in preparing the materials for making Bricks, which improvements are also applicable to other purposes."—21st September, 1837; 6 months.

Samuel Cowling, of Bowling, in the parish of Bradford, in the county of York, Barber, for his invention of "Improvements in raising Water, applicable to various purposes."—21st September, 1837; 6 months.

William Joseph Curtis, of Deptford, in the county of Kent, Engineer; for his invention of "An improved Boiler or Apparatus for generating Steam."—21st September, 1837; 6 months.

Thomas Simmons Mackintosh, of Coleman-street, in the City of London, Engineer, and William Angus Robertson, of Islington, in the county of Middlesex, Gentleman, for their invention of "Certain improvements in Steam Engines."—28th September, 1837; 6 months.

ELEVATION OF THE OXFORD AND CAMBRIDGE UNIVERSITY CLUB HOUSE.



Sir Robert Smirke, R.A., F.R.S., and Sydney Smirke, Esq., Architects.

The Building, the front of which is here described, is erected on the south side of Pall Mall, near St. James's Palace, and is intended, as its name denotes, as a *rendezvous* for Members of the two Universities of Oxford and Cambridge. The front extends 87 feet in width, its height being 57 feet from the ground line to the top.

An entablature, marking the separation of the ground story from the principal floor, and projecting forward in the centre of the building over four Corinthian columns, divides the front, horizontally, into two equal parts. The centre space on the ground-floor is occupied by the portico, which projects to the front line of the area, the centre intercolumniation is wider than the rest, forming the entrance to the hall; the four columns stand upon pedestals, 4 feet high, with base mouldings and cornice. The upper part of the building is terminated with a delicate Corinthian entablature and balustrade, proportioned to the whole height, breaking forward with the centre of the building, which corresponds in width with the portico on the ground-floor; thus the front is divided vertically into three main compartments, the centre being less in width than the other two, which assume the appearance of wings—the effect of a centre, indicated by the projecting portico on the ground-floor, being thus maintained throughout the whole height of the building.

The angles of the centre division, on the principal story, are formed of rusticated pilasters; the principal window occupies the space between these pilasters, which having neither bases nor capitals, produce a uniformity in the lines round the window, giving it the appearance of being contained in a frame. This window, designed with *antæ* in lieu of architectrave, supporting an enriched entablature, is much wider than the rest, and standing clear of the pilasters, with its mouldings to profile, forms in itself a feature in the design. Rusticated pilasters, similar to those already described, divide each wing on the principal floor into three equal recessed oblong spaces, containing the windows, similar in design to the one already described, except that the mouldings to the antæ and entablature do not profile, but stop against the inner side of the pilasters. The ground story is rusticated, and the windows have semicircular heads, with radiating rustics, and impost mouldings. A balcony, projecting 3 feet, continues throughout the whole line of front, and breaks forward with the portico, the parapet being formed of pedestals, with intervening panels of richly-designed foliage, cast in metal in high relief, and the landing supported by elaborately enriched consoles. The frieze of the entablature over the ground story is filled with convex panels, enriched with laurel leaves, and over each column of the portico are shields, bearing the arms of the Universiti es. The whole of the ornamental detail throughout is designed to correspond in richness of effect with the Corinthian capitals of the columns, which have their central volutes entwined. Below the ground story there are two stories, a *Mezzanine* and basement, which are screeend by the area parapet.

The bas-reliefs in the panels above the windows of the principal floor require particular notice; they are executed in Roman cement by Mr. W. G. Nicholl, from designs by *R. Smirke, Esq., R.A.* and illustrate those exalted labours of the mind which it is the peculiar province of the Universities to foster and promote. They recall to mind the sovereignty of Greece and Italy in the divine art of poetry, and the full measure of intellectuality vouchsafed to the inhabitants of this our portion of the globe. In the centre panel Minerva and Apollo preside on Mount Parnassus, a female figure personifying the river Helicon forms part of the group, and pours from an urn the source sacred to the God of verse; the Muses surround them at the foot of the Mount. In one of the extreme panels allusion is made to the popularity of the Iliad, in which Homer is repesented singing to a warrior, a female, and a youth; in the other, Virgil is represented singing his Georgics to a group of peasants: the remaining four panels represent, 1st, Milton reciting his verses to his daughter, inspired by a superior agency seen hovering over him; Shakspeare attended by Tragedy and Comedy; Newton explaining his system; and Bacon recommending his philosophy to his auditors.

Although a description of this architectural composition, and not criticism, is our intention at present, we may be permitted to observe, that it possesses an air of monumental grandeur, admirably suited to a

building, which, from its connexion with the Universities, awakens attention to those proud features of our Constitution; and furthermore, that too much cannot be said in favour of the practice resorted to in this building, of courting the aid of the sister arts to enliven architecture, and reveal the intention of the building; especially when the opportunity offers, as in this instance, of thereby imparting to the edifice a highly intellectual character.

The public, who must ever feel interested in the judicious application of sculpture to buildings erected at the expense of the nation, cannot but applaud that taste and liberality which, as in the case before us, prompt a public display of the art on the part of privatei ndividuals.

Were the love of art more general with us, and did proofs of taste, as diplayed in this instance by the Members of the Oxford and Cambridge university Club House, occur more frequently, buildings would then often become not only entertaining to look at, but highly instructive—the enlivening influence of their mental character would tend to dispel the vacancy and weariness unconsciously produced in the mind by a constant repetition of long rows of unmeaning dwellings.

We had intended to have given the ground-plan of the building, which we are compelled to defer in consequence of the engraving not being ready. It will appear in the next Number, which will also contain a description of the interior.

REVIEWS.

Thoughts on the Experience of a better System of Control and Supervision over Buildings erected at the Public Expense; and on the Subject of Rebuilding the Houses of Parliament. By Lieut.-Col. the Hon. Sir Edward Cust. London. J. Weale, 1837.

We had thought that the brisk pamphleteering in which so many gentlemen, both professional and non-professional, favoured the public with their opinions, pro and con, on the subject of rebuilding the Houses of Parliament, was entirely over; when lo! our attention is directed to that point at our very outset, by these "Thoughts" of Sir Edward Cust's. The title-page is so explicit that it spares us the necessity of explaining what is the purport of the publication; we therefore proceed at once to inform our readers what views the writer entertains, and what course he recommends as most likely to introduce and establish that "better system" which not only is so greatly needed, but seems to be demanded both by the public and the profession. There is, however, another question upon which Sir Edward first of all touches, namely, the very great delay which has been suffered to take place in regard to commencing the new Houses, which, he contends, were it not for very idle procrastination, might at this moment have been in the second year of their progress. We are inclined to join with him in this complaint; for although we would not recommend inconsiderate precipitancy in an affair of so much importance, we could wish to see more vigorous alacrity in setting about and prosecuting so important a work when once decided upon. When fairly commenced, we trust that the works will be carried on with all the expedition consistent with good construction and execution; for although on such occasions the utmost circumspection and foresight are advisable, delays are apt to be exceedingly dangerous. Of this there are many notorious instances, and even where the buildings have not been left in an unfinished state, but ultimately completed, after one or two generations have in the interim passed away, and of course the original architect along with them, they for the most part betray plainly enough, that each architect has in turn innovated upon or departed from the design of his predecessor.

Sir Edward takes no notice of what has been urged—and, that too, rather recently—against the style fixed upon for the new Houses; neither shall we, but come at once to his second and highly important question, viz.—"whether it would be desirable to pursue the same plan of proceeding at any future opportunity when a project of public building shall require to be again considered?" How he is disposed to answer it may easily be guessed; and he fairly enough remarks, that the profession acquiesced beforehand in the course fixed upon; he might have added, that they—at least all the competing architects—acquiesced in the style prescribed to them. There might indeed be many who did not do so very cordially; but then they ought either to have remained aloof, or else have jointly remonstrated and petitioned against it in the proper quarter, while there existed opportunity for altering the conditions, instead of afterwards endeavouring, as some have done, to get the decision set aside, and have the whole business commenced *de novo*.

That the writer should put in a favourable word for amateurs, and assert their competency to decide on the merits of works of architecture, is no more than was to be expected. It may, indeed, be urged, on the other hand, that the judgment of such persons will extend to little more than what are chiefly matters of taste, in other words, matters of art, not of science. Granted; but this amounts to allowing them to be sufficiently well qualified for deciding in regard to that precise species of merit in which the public are most concerned, and wherein one architect most differs from another—that, in short, which is the essence and *sine quâ non* of the art as an art, and without which all other merits stand almost for nothing. "Correctness of eye," observes Sir Edward, "is as much a natural gift as correctness of ear, and a just taste for what is great and beautiful will often be found to preside over architecture, as it is known to do over poetry and music, by those who could as little compose a line or a bar as draw an elevation." This is undoubtedly correct; still, in order to qualify himself as an able critic, a man must sedulously cultivate such natural gift, and familiarise himself with all the niceties of the art—which he may do without a practical acquaintance with construction, although not without some knowledge of its principles.

Perhaps it has happened, that because practical knowledge is indispensable to the professional man, whereas, if he be deficient in taste or art—for art may be considered as the power of manifesting taste—he contrives to shift without it as well as he can, or take it from others at second-hand;—perhaps, we say, it has on this account happened, that those who possess the former without the latter, consider it the height of ignorant presumption in those who possess the latter without the former, to set themselves up as critics.

The relative position of architecture and criticism is precisely the same as it is in regard to the other arts. Those who follow them without manifesting any ability in them, will, whenever they have the opportunity of doing so, deprecate criticism as officious and impertinent—the ill-natured profession of those who cannot do better, or even so well, themselves. Thus is it also in architecture; while the true artist, on the contrary, will look to its approbation as his worthiest and most durable reward.

There are no doubt more pretenders to criticism than real critics, and this is more particularly the case in regard to architecture, in which a superficial knowledge is apt to acquire for a man the reputation of an amateur. How is this to be remedied?—not by attempting to make a mystery of the art, but by encouraging the study of it as far as possible. Let the number of amateurs increase—that is, let the public in general become such—and the monopoly of authority in matters of taste, now enjoyed by a few, will terminate. Mere ignorant pretenders to taste would then either withdraw from the field altogether, or keep silent; while those who wished to be looked up to as leaders in taste would feel that they must exert themselves in order to keep before the rest of the public; in addition to which they would become more circumspect when they discovered, that instead of their opinions being, as at present, received as dicta of high authority, their soundness or impartiality would be constantly liable to be challenged. Besides all which, architects themselves are spurred on to acquit themselves to their very best; feel applause to be more worth seeking, censure more solicitously to be guarded against, when they are aware that the many are able to discriminate between talent and no talent, than when they have to do with an indifferent, drowsy, and but half-awake public.

We have said so much upon this point—one in regard to which there exists such strange misapprehension, as to render it desirable it should be set in its true light—that we have left ourselves very little room for noticing what many may consider far more worthy of attention, namely, the question—"whether every precaution has been taken to give the public the assurance of a good result in the plan selected, and about to be executed?" In Sir Edward's opinion, there are many considerations in regard to the projected pile of building which require to be maturely weighed beforehand. "The public," adds he, "I am sure, will have to thank me for pointing them out, even if it should find that my suggestions have been made in error; since it is of the first importance to know that some competent authority has determined alterations to be necessary and advisable before they have been undertaken." "I desire, then," he afterwards continues, "to impress upon the public the necessity of requiring an efficient supervision over our public works from their commencement; and I would particularly appeal to them not to be led away by the absurd supposition that this control is improper and unfair upon the architect, when it is essentially necessary for our interests, and for that of the public purse, that the same check should be placed upon the public architect, and the needless waste of money, which has been the consequence of his irresponsibility, that is obtained (?) by an individual in his private practice." No doubt there ought to be some sort of check upon the architect of a public work; he ought not to be totally irresponsible; but then neither ought he to be thwarted or fettered; and although it might be expedient in many cases to suggest alterations during the course of the work, we think they ought not to be authoritatively forced upon the architect if he could show that they would upon the whole be unadvisable.

Hitherto one great cause of the jobbing and failures which have

attended so many of our public buildings, is, that they have generally been carried on quite in the dark, without anything respecting them being known until what might have been timely remonstrance and advice, could be no more than the expression of dissatisfaction and disgust. With the intended Houses of Parliament it is otherwise. Here we know at least what we are to expect, and have only to hope that Mr. Barry will not be cramped in the execution of his edifice. A precedent has thus been established that will, we trust, be henceforward followed in all similar cases, or if deviated from, that it will be only by having the designs publicly exhibited for a certain time before the names of their respective authors are divulged, and before the selection of any one of them be actually made. Public buildings are matters that require to be much more carefully attended to and looked after than they have hitherto been, and that not only as regards expenditure, but taste also, for we have ere now had the maximum of the one with the minimum of the other; and making use of Sir Edward's words, "to what," we ask, "can this be attributed, but to the defect in the constitution of that department of our executive to which these matters ought to belong, who have either been superseded in the duties by the interference of a Committee of the House of Commons, or who have voluntarily abdicated their functions, and transferred the whole discretion of a public work upon an officer paid in exact proportion to his own extravagance, without either check or control?"

Temples, Ancient and Modern: or Notes on Church Architecture. By William Bardwell, Architect.

Luckily our first mention of this book was couched in brief and rather general terms, else should we have greatly committed ourselves, for we must now acknowledge, that it has most wofully disappointed us in every respect. We have discovered that the wood-cuts had previously appeared in Brayley's "Graphic Illustrator," and that even most of the plates are likewise taken from other publications; for instance, that of Whitby Abbey from a little book, published in the course of the present year, on the Whitby railway. As regards the former, they serve at least fully to account for the fulsome compliment in the preface to Mr. Brayley of the Russell Institution, though we apprehend, that henceforth Mr. Bardwell will be very shy of that gentleman's "warm-heartedness" and kindnesses, and say—*Timeo Danaos et dona ferentes*. Not content with borrowing, Mr. Bardwell goes a step further —and a most unaccountable step it is—for he actually treats us with a fac-simile of the interior of St. Mary Woolnoth's, in Britton and Pugin's "Public Buildings," with this difference, that in the original the name of Bradberry appears on the plate as that of draughtsman, while here, "W. Bardwell" is substituted for it! That it is a copy and not a fresh view from the same point of sight is evident, because, had the latter been the case, there would infallibly have been some discrepancy between the two; yet now there is not a hair's breadth variation; on the contrary, both exhibit, even to the fraction of an inch every way, precisely the same space. If this be mere coincidence, it is the most miraculous instance of it upon record. Another very odd thing is, that the plates in general have very little connexion indeed with the text; the subjects of some are not even so much as mentioned in it, and others, such as the Mausoleum of Shere Shah, (copied it seems, "by permission," from one in "Elliott's Views in India,") and the atrium of a Roman house, are not so indispensable but that they might have given room to what would have been more useful as well as appropriate in a work on Church Architecture, especially one by a professional man; although we must at the same time confess, the original specimen Mr. Bardwell has given us in his design for a City Church, with the steeple at one corner of the front, does not make us particularly desiderate more. Before we take leave of the "illustrations," as we suppose they must be called, we must remark, that the author has not very strictly adhered to the terms of his prospectus in regard to them; because promise was there made of some coloured ones, instead of which, there is only a single one of the kind, and what it is we defy any one beforehand to guess. Is is some polychrome temple?—some gorgeous shrine?—some Gothic sanctuary, all radiant with hues flung through its rich-stained windows? or some such lavishly decorated piece of architecture at the Capella Borghesiana? Oh no! there would have been nothing at all extraordinary in selecting a subject of that kind, whereas we feel almost stunned and stupified at meeting with a piece of neat waistcoat pattern, buff with narrow blue stripes, which, we are informed, is the fac-simile of the banner borne by Pharaoh when he and his host were drowned in the Red Sea!! This is indeed marvellous, prodigious! as Dominie Sampson would say.

Let us now examine whether Mr. Bardwell has done at all better with his pen, for his book contains 234 ample pages of letter-press, exclusive of preface, there must of course be something in it, or if not, that would, perhaps, be the strangest affair of all. Something in it! truly there is great deal in it that is very little indeed to the purpose, except Mr. Bardwell's chief object was to show how easily a big book may be made, and to give the world a notable example of the art of book-making. How rigmarolishly he treats his subject will be evident at once from the contents of some of the chapters. In the first we have "arguments in favour of limited parishes—attachment to the church—architectural propriety, a cause of that attachment"! Whether this last argument will be greatly relished by the church itself, or taken as at all complimentary, we forbear from inquiring. Chapter II. is on the "Duty of supporting a National Church;"—Chapter III. "On the Advantages of a National Church;"—Chapter IV. "Errors in the Architectural Details of late-erected Churches;" immediately after which follows a chapter on the 'Origin of Architecture." Was there ever a more preposterous jumble? Truly the three first chapters might have very well been omitted altogether, being a work of supererogation; or does Mr. Bardwell fancy that the public require to be roused by him to take into consideration the duty of supporting a National Church; or that, if indifferent to it, their zeal is likely to be awakened by an exhortation from one who comes forward with his ideas for "altering City Churches?" If not an amateur architect, our author is certainly an amateur preacher; yet we would recommend him to desist from his preaching for the future, and stick to what is more in the way of his own profession. What little, however, he does say in one of these chapters on the subject of Churches, is exceedingly fantastical; for he tells us that,

> "A church should be erected at the west end of the Green Park, with a fine portico and cupola, something in the style of the *Superga*, or like the Church of the Assumption at Paris; and another church in the lancet-arch style, with a very lofty spire, near Chesterfield Gate, Hyde Park. These churches are *features* absolutely necessary to that part of the metropolis; and money for their erection should be voted by Parliament, if we would not merit the charge of infidelity or barbarisms now justly urged against us by the stranger, &c."

This is positively ludicrous. Two churches on those particular sites are, it seems, requisite not because there happens to be any need for them, but as "features;" and until they be erected we are justly liable to the charge of infidelity!!! The one which our architect insists upon having built near Chesterfield Gate, is, we suppose, intended for the edification of the Sunday promenaders in Hyde Park, and in order that strangers, when they enter the metropolis on that day, may imagine that those well-dressed crowds are all flocking to their devotions, or else that the church is so crowded within, that there is no room for any of them. We find, too, that not content with assuring us churches ought to be forthwith built on those identical sites, Mr. Bardwell also informs us in what particular style each of them ought to be, which is being very particular indeed. We do not see wherefore he should dictate so long beforehand on that head, instead of leaving the architects to follow their own ideas in regard to style, and if possible give us something more original than an imitation of either the *Superga* or the *Assumption*. Wherefore the other church, if Gothic at all, should be in the lancet-arch style, is a puzzle Mr. Bardwell does not help us to explain.

Although very oddly dragged in, the fourth chapter is one of the most sensible and useful in the whole book; it is, however, almost wholly compilation, and chiefly of remarks upon some of the lately-erected churches, from the "Gentleman's Magazine:" but it would not have been amiss, and certainly not attended with any additional labour, had the respective structures been named; for in these detached criticisms we read of "this tower," "this church," &c., without knowing what particular church or tower is spoken of, consequently cannot always judge how far the remarks themselves are just. Some of these fragments are gleaned from other sources; at least No. 13 is from Fasciculus II. of Candidus's "Note Book," in the "Architectural Magazine;" and as Mr. Bardwell pays it the compliment of saying, that it is "*a most valuable piece of criticism*," he surely might have confessed to whom he was indebted for it. But although here and there he avowedly borrows or quotes, we have detected very many passages where he has unscrupulously and unceremoniously availed himself of the labours of others without acknowledgment at all—not even where he has copied verbatum, and to considerable extent. This sort of peacocking in borrowed plumes is no less dangerous than despicable, and he who condescends to it, runs the risk of being suspected of having stolen more than he can actually be proved to have done. In the very next chapter, which, strange to say, is upon the "Origin of Architecture" —for, if anywhere, the most fitting place for such topics would have been the beginning of the book—we meet with a peacock's feather of some length in the following passage:—

> "Mechanical rules are certainly indispensable to the architect, but to suppose that they are all-sufficient, is nothing short of denying the pretensions of architecture to rank as a fine art. If it can be proved to admit of no other beauties than those already given to the world, and which may be repeated at will; if it have no latent charms responding to the call of master-minds, the sooner we undeceive ourselves as to its real nature the better: let us honestly admit that the world has been imposed upon, and that henceforth architecture must be classed with arithmetic and other studies of that nature, rather than with those pursuits with which it has been hitherto associated. This is what the system of Vitruvius leads to; it attaches *undue* importance to rules, and inculcates a slavish adherence to precedent, while for criticism it substitutes a pedantic jargon, full of impertinences and puerilities; almost making a merit of dulness, it discountenances any attempt at advancing a single step forward, repressing genius, and anxious only to preserve respectable mediocrity, &c."

This passage we have certainly met with before; *where* we cannot positively assert, but think it occurs in one of the architectural articles in the "Foreign Quarterly." Should we happen to be mistaken, Mr. Bardwell can so far correct us, but he cannot possibly contradict us as to his not being the author, although he has passed it off as his own. Even one such gross instance of plagiarism would be discreditable enough; what then are we to say when we find, that with the alteration of a few words, the account of the remains of the Temple at Karnac, at pages 76 and 77, are taken from the first volume of "Egyptian Antiquities," forming part of the "Library of Entertaining Knowledge;" with this difference, however, that it is much less satisfactory, being in fact an abridgment of the other, and omitting many interesting particulars. Now, two writers going to the same source for their information would undoubtedly agree in substance, but certainly not tally so exactly as we find Mr. Bardwell's account does with that in the popular little work above mentioned. Why, as he was not above availing himself of it, he should be above acknowledging his obligations to it, we know not—perhaps

he thought it would be *infra dig* to mention it as authority; yet, in our opinion, it is even more *infra dig* to be caught actually pilfering, and afterwards retailing stolen ware.

Chapter XVIII., which is upon the "Advantages to be derived from the Cultivation of a Pure Taste, and on the Increase of Architectural Taste in England," consists almost entirely of an account of some of the late public works at Paris, given in a letter from M. Le Bas, and, if we mistake not, previously printed in the "Transactions of the Society of British Architects." We do not object to it in itself, for the pages thus occupied are more valuable than almost any others in the whole book, but we certainly do not see what particular connexion it has with Mr. Bardwell's professed subject. However, it is useful in more than one respect, since without it that chapter would have been exceedingly brief and meagre indeed. The "advantages, &c.," are insisted upon in a very common-place way—very much in accordance with the "nothing-like-leather" principle. Nevertheless, we cordially commend what is said respecting its being "the duty of the profession to educate the public eye," and to co-operate for the advancement of their art, abstaining from those petty jealousies to which they have hitherto shown themselves too prone. In all sincerity, likewise, do we applaud the liberal feeling which displays itself immediately afterwards in the following passage:—

"The great number of styles which exist at the present day, though they have not put architecture on the best footing, have yet called forth a greater variety of talent than anciently; and it is to be hoped, that, as those professors disappear, *whose only excellence consists in making exact copies of what they find in books*, the art will become more imaginative and intellectual, and architects will assume their proper rank in society. That architectural taste is rapidly increasing amongst us, it is impossible to deny. The superiority of some of the buildings of the present day over those of the immediately preceding century, proves it abundantly;" [what does Welby say to this?] "and we have a school of young architects rapidly coming forward, whose productions, as exhibited at various public meetings, would do honour to any age or country. I am indeed thoroughly persuaded, that the English people only require to have their attention drawn to the importance of public buildings. One tasteful monarch, one enlightened minister, is able to work wonders in advancing the taste of a whole people. The present illustrious sovereign of Bavaria, with his very limited resources, is doing more for the advancement of the Fine Arts, and consequently laying a foundation for the present and future welfare of his kingdom, than most of the other nations of Europe together."—Pages 188 and 189.

For this well-deserved tribute of praise to Ludwig of Bavaria, Mr. Bardwell must expect to be taken to task by Mr. Gwilt. He has evidently imbibed some of the "Foreign Quarterly" Reviewer's "poison," and is now endeavouring to infect others. Yet how happens it, that notwithstanding he appears to sympathize in opinion with that writer, he has so cautiously avoided in any one instance referring to him, or informing his own readers where they might find further evidence of the King of Bavaria's taste and enterprise? Really we can attribute this marked silence to hardly anything else than the apprehension, that by naming the "Foreign Quarterly," he would have been putting them upon the scent for discovering some of his own plagiarisms. Chapter XIX. and XX. announce themselves as the most important in the whole volume, being entitled "Principles for Building New Churches," and "Interiors." Here we certainly expected to meet with some valuable hints and remarks, particularly as the subject is in itself almost entirely new, and one in regard to which an architect might bring forward several fresh hints. Instead of which, although they would have furnished matter for an entire volume, they are hurried over in a very few pages; yet perhaps we are wrong in saying hurried over, since even those few pages are spun out with much that is irrelevant. There is a good deal of twaddle about a savage's "feeling no want of Homer or Milton," about the Medici Family, Townley, Hope, and Angerstein, but nothing as to whether it would be possible to improve upon the present mode of pewing and putting up galleries in churches, so as to promote, instead of interfering with, architectural character and effect;—also, whether, supposing the style to be Grecian, it would not be far better to light them entirely from above—which might be done according to a variety of modes—and thus get rid of side windows, which, besides being generally injurious to external design, admit sound from the street. Almost all we can gather from what Mr. Bardwell says is, that churches ought to be faced with stone, both withinside and without; that "if the Legislature were to resolve upon the erection of fifty new churches in London, to be built of Irish marble, such edifices would cost the country nothing" !!! and that we ought to "leave off caricaturing Catholic architecture, and make designs in the Italian style, or in the style of Wren's churches." How this latter piece of advice agrees with what is said in the passage we have quoted from page 188, we do not understand; neither do we at all agree with him when he points to Gibbs's church of St. Mary-le-Strand as a happy specimen that the Italian style is susceptible of the utmost enrichment, for, in our opinion, he could hardly have pitched upon a more unmeaning, gingerbread composition.

Chapter XXI. is on "Music in Church Worship;" but we are grateful that it also proves chapter the last, for on coming to that we fancied Mr. Bardwell would not conclude without inflicting upon us a chapter on Preaching.—After all, we cannot part in ill humour from one who has a strong relish for humour himself, and has indulged it so far as to clap opposite to his frontispiece the effigies of old Kraft of Nuremberg, palpably for no other purpose than thus to allude hieroglyphically as the modern Craft of book-making.

Appendix to Elements of Architectural Criticism, in a short Notice of the Foreign Quarterly Reviewer. By Joseph Gwilt. London, 1837.

It is well for Reviewers that there happens to be only one Mr. Joseph Gwilt, for not only does he seem disposed, but plainly threatens, to have the last word with the critic who has given him so much offence in the "Foreign Quarterly," and to whom this "Appendix" is intended as a reply, just as the "Elements" were an attack upon the architectural papers in that periodical. In this literary feud Mr. Gwilt was most certainly the aggressor, and as it appears to us is rather on the losing side of the argument; for on comparing his "Appendix" with the article in the "Foreign Quarterly," intended by way of answer to the "Elements," we find that he has taken no notice whatever of one or two rather material points in the controversy, which, supposing he is able to do so, he would have employed his pen much more to the purpose in refuting, than in pouring forth sentence after sentence of sheer abuse against one who, he affirms, has not the "slightest pretensions even to taste," and whose criticisms, he assures us, are held "in utter contempt." Whether such be the case or not, it is very evident he does not consider him so very contemptible, or he would hardly have published a book expressly directed against that individual Reviewer; on the contrary, he seems to think him a particularly formidable personage, for he actually talks of his "scattering poison abroad." It is a wonder he did not compare him to "the pestilence that walketh in darkness." Were it not highly ludicrous, this would be very hard language for no more heinous crime, than that of admiring Schinkel, and refusing to acknowledge the supremacy of Palladio. In our opinion, Mr. Gwilt could not do better than ship off a cargo of his antidote to Germany, that being the infected land—the country completely "poisoned" with that bad taste which the Reviewer has merely imported from it.

For our part we wonder Mr. Gwilt should take it as any compliment—particularly as there is nothing to make it look like one—that his book was "associated" with that of a German, at the head of the article in the 38th Number of the "Foreign Quarterly." Truly Mr. Gwilt's notion of *association* is pretty much akin to those he has of *poison;* we really know nothing to parallel it except it be that of Mr. Britton, who fancies he is now "associated with Dr. Faraday, one of the most scientific chemists of the present age"! (See the prefatory essay to his "Worcester Cathedral.") But *revenons*—to our great surprise Mr. Gwilt pleads guilty to one charge brought against him by the Reviewer, viz., that of having compared the columns of the London University to a row of skittles or Dutch ninepins. He says, indeed, that he affixed his initials to the "criticism" in question, when first printed in the "Atlas," and afterwards reprinted it with his name at full length. This explanation certainly does away with the reproach of anonymousness; but then it admits by very far the heaviest part of the censure, for criticism must have been sadly at loss and pushed to its last gasp before it could condescend to mere vulgar, unmeaning abuse, which would apply to any other columns—even those of his favourite St. Martin's Church—just as well as Mr. Wilkins's.

In reply to the Reviewer's accusation, that his "Elements" are in fact no elements at all, he now tells us they were intended only "as a few hints." If so, wherefore did he not give that more modest title to his book, instead of affixing to it one that is literally *imposing*, even according to his own confession? At least we humbly conceive there is a wide difference between mere hints on any subject, and elements of criticism regarding it. In our opinion, therefore, Mr. Gwilt would have done well to have treated that part of the Reviewer's answer as he has chosen to do some others—with silent contempt. At present he makes a woful bungle in attempting to excuse himself, by telling us he disavowed in the first page of his book any intention of making it in accordance with its title. In regard to his singular doctrine respecting proportions, he still stoutly adheres to it, not caring to admit that he understands the term very differently from what most other persons do; because orders and different examples of the same order are said to vary in their proportions, although the column and the entablature may be equally well proportioned to each other in all. But as far as we can understand Mr. Gwilt, it matters not whether the columns be four or ten diameters in height, the proportions of the order are the same, provided the entablature be proportioned accordingly.

Among those passages of the Reviewer's to which he has not attempted to reply, is the following:—"Few as the examples actually are which we have of the Grecian Ionic, they suffice to convince us of the great freedom and ductibility of that style, and show more of true architectural invention than all the examples of the Italian orders put together." Are we to infer from his silence, that Mr. Gwilt acquiesces in such *poisonous* doctrine as this; or, that notwithstanding his boast, he is not prepared with an "antidote" against it? Again, he leaves his favourite Italian completely in the lurch, allowing the Reviewer to reproach its Ionic as being "meagre, harsh, and the very reverse of graceful throughout," without putting in a syllable in its defence. "Call you this serving your friends?" Neither does he, when mentioning Schinkel, notice the blunder with which his opponent twitted him, when he called the façade of the Berlin Museum a "meagre display," "all sameness," yet like the composition of a scene-painter—of course scenic. As little does he attempt to defend his unaccountably hypercritical objection against the eagles over the columns of the same façade. Perhaps, out of complaisance to Mr. Gwilt, and with the view of propitiating him, the architect has since caused them to be removed; or if not, Mr. Gwilt is again blundering, for he now speaks of "eagles," not "victories," as applied to the prize of the Wacht-gebäude. Unless we ourselves too are greatly mistaken, he is very greatly so indeed, when he says it is one of the "amusing fancies of the Reviewer," that a person cannot sincerely admire more than one style or school of architecture. Now, our impression is, that in one of his papers, the Reviewer has maintained expressly the contrary, and strongly protested against an exclusive taste for any one style of the art in particular.

Almost had we forgotten to observe, that Mr. Gwilt calls in Goethe as his ally

in the cause of Palladian architecture, hoping by his aid entirely to discomfit his adversary. Now, though Goethe may be quite a "knock-down" authority in matters of literature, it does not follow that his authority is itself unquestionable in questions of architecture. Hardly can Mr. Gwilt have been hoaxed into mistaking him for one of his own profession—yet to be consistent he ought to hold him in scorn as an amateur. He nevertheless scruples not, in this instance, to put more faith in the opinion of such a writer than in that of either Robert Adam or Woods, both professional men, and who have expressed themselves contemptuously enough in respect to the Teatro Olimpico. Since the time Goethe's remarks were penned, a more exact study of Grecian architecture and of the beauties of its detail, has, we suspect, opened our eyes more than formerly to the errors of the Palladian school. Be that as it may, we would recommend Mr. Gwilt to peruse the chapter on Vicenza in a recent work, entitled "Notes Abroad," after which, should his admiration of Palladio continue unabated, he will doubtless take up his pen and inflict a hearty castigation on that most anti-Palladian writer. We would, however, advise the author of the "Examples" to limit his curiosity to that particular chapter, for should he allow it to draw him on to read the work through, he will infallibly stumble upon something infinitely more unpalatable to him.

The History and Antiquities of the Manor House and Church of Great Chalfield, Wiltshire, illustrated by Twenty-eight Plates of Plans, Elevations, Sections, Parts at large, and a Perspective View; forming Part II. of "Examples of Gothic Architecture," Third Series. By Thomas Larkins Walker, Architect. 4to. London: 1837.

Such a work as this refutes, on the one hand, the aspersions attempted to be cast upon Gothic Architecture, and advocates its cause, on the other, with far greater ability than the generality of what has of late been written upon the subject. Pursuing the course originally commenced by the late Mr. Pugin, senior, (whose memory, we cannot abstain from remarking, is deservedly held in estimation by every one for the amiableness of his private character,) Mr. Walker here fully displays to us a most choice specimen of Tudor Domestic Architecture, so beautifully, and withal so fully illustrated, as to be even an improvement upon the two preceding series of the "Examples," which were more desultory in their plan.

"At Great Chalfield," says Mr. Buckler, in his highly interesting little volume on the Palace at Eltham, "the excellences of design and sculpture are united. One of the oriel windows, with a top resembling an ancient regal crown, is more beautiful than any other of the circular shape I have seen. The principal front towards the north is entire, the hand of innovation has not presumed to violate any of its principal features; on the contrary, plastered windows, crumbling walls, crooked turrets, a half-filled moat, and a dilapidated bridge, whose single arch bends across the muddy foss, strongly urge the belief, that this venerable place is resigned to time to effect without a helper the gradual decay of the materials." Such being the case, all the more grateful ought we to feel towards Mr. Walker, whose equally tasteful and accurate pencil has here restored every feature of the original design, and thus not only rescued it from the destruction which probably awaits the building itself, but also put it in most convenient and accessible form for study and reference. Hitherto, on the contrary, it does not seem to have been by any means so generally known as it deserves to be, since even Rickman merely says in regard to it, "*Great Chatfield* House and Mill deserve examination;" but as he has mistaken the name, he probably never saw it.

In this mansion, which Mr. Walker conjectures to have been erected towards the close of Henry the Sixth's reign, most of the windows are pointed, and have arches struck from four centres, with corresponding hood-mouldings. Even the arch of the porch is not enclosed by a square-headed label, but treated the same as the windows; and, like theirs, its hood-mouldings are returned in the form of a square, or escutcheon placed diagonally, by no means a common, although a very elegant practice. Hence, the character differs considerably from that of the later Domestic Tudor, many of whose enrichments, such as string-course, moulded and embattled parapets, and clusters of highly-decorated chimneys, are here wanting. Nevertheless, the composition is so excellent, and the parts themselves, although few, so elegant and appropriate, that nothing seems wanting. Variety, accompanied with some degree of irregularity, does not destroy unity, neither are simplicity and breadth of effect sacrificed to richness—and few things of its kind can exceed in richness the eastern or semicircular oriel, already mentioned in our quotation from Buckler. Whether this happy combination of qualities be entirely the result of study directed by taste, or in some degree likewise of felicitous accident, certain we are, that it cannot be too carefully studied by those who wish not so much to copy this particular style, as to enter into its spirit, and imbue themselves with its feeling. It is this spirit and feeling which the cleverest of our copyists and imitators show themselves most deficient in, and which they should consider no labour too great to attain; and we will further venture to affirm, that where they are absent, it is quite hopeless to look for aught excellent in the way of originality.

In this example, the plainest details are replete with expression; and herein alone, independently of other merits, it is, together with the entire class to which it belongs, immeasurably superior to the puerile, unmeaning gewgaw, and nonsensical frippery of the so-called Elizabethian style, which we are sorry to find so much in favour at the present day among those who are looked up to as the leaders of fashion in Architecture.

With the exception of the very beautiful screen in the hall, and some chimney-pieces, the interior affords little in the way of express decoration; neither would the house itself be at all adapted for a modern residence. There are, however, one or two good ideas in the plan, which an intelligent architect will be at no loss to discover, and to appropriate as opportunity for doing so may arise. As we shall ere long probably bestow some notice upon the First Part of this Series, containing "The Vicar's Close at Wells," we dismiss the work for the present somewhat more hastily than we otherwise should do, but not without congratulating Mr. Walker on having such subjects reserved for him, and still more for the praiseworthy industry and ability with which he has illustrated them.

Guide along the Danube, from Vienna to Constantinople, Smyrna, Athens, the Morea, the Ionian Islands, and Venice. From the Notes of a Journey made in the Year 1836. By R. T. Claridge, Esq. Paris: Galignani. London: F. C. Westley. 1837.

The professional education of the painter, the sculptor, and the architect, was always considered incomplete, until he had visited in foreign countries those splendid monuments of the arts, left to us by the masters of former times, and whose annihilation has hitherto defied the sweeping powers of the scythe of Time. It has been admitted, that a careful examination of these precious relics, of their various beauties and fine proportions, is invariably rewarded by an improvement in the taste and maturity of judgment. If this be so, how desirable it becomes, that every possible facility be given to assist the youthful professor in obtaining for himself these advantages! At present, he too often, from the apparent magnitude of the undertaking, defers from time to time the opportunities as they offer, till at length, through the pressure of professional employment, they are lost altogether. We have been led to these remarks by the small work of Mr. Claridge, which came accidentally to hand, when on a recent visit to Paris. It appears to convey, in a concise manner, the necessary directions for a traveller to make a very interesting and instructive tour at the least possible expenditure of both time and money. To enable him to avoid those delays, difficulties, and dangers, which attend in those parts any attempt to search out doubtful sites of ancient places, and other objects of curiosity, the author confines his attention to such objects only as are well known to be worth seeing along the Danube, at Constantinople, in the Dardanelles, at Smyrna, Ephesus, Athens, the Ionian Islands, and on the way through Italy, by way of Venice, homewards. The author, from his own personal knowledge, states, that the whole of such an interesting journey can be performed within the space of four months, and at the limited expense of less than £120. To effect this, he minutely details the route, and the expenses at every stage of the journey, and sums up or produces a balance-sheet, making the total amount to £114 3s. 2d. He then says,—

> "Thus it will be seen, that a single traveller (whose individual expenses are greater than they would be if he travelled in company with others), taking the best place in the public conveyances, and denying himself nothing to make his journey of the most agreeable description, would find, upon his return home to England, a balance of nearly £6 remaining out of the £120 set apart for his tour."

We have not an opportunity of making extracts from the body of this neat and cheap work. It is, however, full of interesting information respecting the objects worthy of notice, and of their historical associations; for those who contemplate a continental journey, and whose time and means are limited, we would cordially recommend it.

The Artificers' Lexicon for Terms and Prices. Second Edition. By John Bennet, Engineer, &c. London, 1837.

We are at a loss to conceive why the author should call this work a *Lexicon;* the meaning of this word is a Dictionary, and is generally understood to be an explanation or meaning of words, instead of which, the Book is a collection of prices and memorandums; the former, in most cases, are far too high for the present prices, and some are out of all question: for instance, the price in this work of 12 ft. 3 in. best yellow deals is £48 per hundred, which is £10 more than the present price: the prices for plate-glass are double the present charges; to

instance, the price of a plate 85 by 35 inches in this book is £36 1s., the present price is only £18 10s. We are surprised that the author has not corrected this new edition, as his attention was called to those errors when the first edition was noticed in the "Architect's Magazine."

A Treatise on the Strength of Timber, Cast Iron, Malleable Iron, and other Materials. By PETER BARLOW, *F.R.S. &c.* London. JOHN WEALE.

THE name of the author, so justly celebrated for the important works which he has published, and the numerous experiments he has made on the strength of materials, is a sufficient apology for us in calling the attention of our readers to the work before us: it contains the result of numerous experiments which he has made, and minutely enters into all the bearings on the subject, accurately detailing the manner he performed his experiments and their results, together with a collection of numerous tables and experiments made by others. After having explained the various experiments, he draws such practical data from them, which enables any person of a common education to calculate the strength of materials as applied to buildings or machinery.

The importance of a practical acquaintance with the strength of materials is of the utmost consequence, and cannot be too early impressed on the minds of those who are about to enter into the profession, either as an engineer or architect, as it ought, together with a knowledge of construction of buildings and machinery, form a leading feature of their education: we should like to see competent professors engaged by the Institutes, to give one or more courses of lectures on this important branch of Architecture for the benefit of pupils.

"On the Strength of Timber."

"1. There are four distinct strains to which a beam of timber, a bar of metal, or any other hard body, may be exposed, and in which the mechanical effort to produce the fracture, and the resistance opposed to it by the fibres or particles, are differently exerted; while each of these again is subject to various modifications, according to the manner in which the bodies are supported or fixed, the positions in which they are placed, and the direction of the forces or strains to which they are exposed.

"These four distinct cases or strains may be stated as follow:—

"1st. A body may be torn asunder by a stretching force applied in the direction of its fibres, as in the case of ropes, stretchers, king-posts, tie-beams, &c.

"2dly. It may be broken across by a transverse strain, or by a force acting either perpendicularly or obliquely to its length, as in the case of levers, joists, &c.

"3dly. A beam or bar may also be destroyed by a pressure exerted in the direction of its length, as in the case of pillars, posts, and truss-beams.

"4thly. It may be twisted or wrenched by a force acting in a perpendicular direction, at the extremity of a lever or otherwise, as in the case of the axle of a wheel, the lever of a press, &c."

Experiments on the Strength of Direct Cohesion of the Fibres of different kinds of Wood.

There are considerable differences among writers as to this branch of inquiry, particularly in the experiments of Musschenbroeck, which are so different from those of Mr. Barlow, that it must clearly show that there is some decided defect in the performance of the experiments; which may be easily accounted for by the very great difficulty in obtaining a direct force, so as to prevent the material under experiment being fractured by torsion or a transverse strain. Mr. Barlow took considerable pains and trouble to overcome this difficulty, and after having performed numerous experiments, which are detailed in the work before us, he gives the following as the mean result, employing only the nearest whole numbers as *"the strength of direct cohesion on a square inch."*

	lbs.		lbs.
Box is about	20,000	Beech	11,500
Ash	17,000	Oak	10,000
Teak	15,000	Pear	9,800
Fir	12,000	Mahogany	8,000

"*Practical Rule.*—Since the strength of direct cohesion must necessarily be proportional to the number of fibres, or to the area of the section, it follows, that the strength of any rod will be found by multiplying the number of square inches in its section by the corresponding tabular number, as given above.

"This, however, gives the absolute strength, or rather the weight, that would destroy the bar; and practical men assert, that not more than one-fourth of this ought to be employed. I have, however, left more than three-fourths of the whole weight hanging for twenty-four or forty-eight hours, without perceiving the least change in the state of the fibres, or any diminution of their ultimate strength."

On the Transverse Strength of Timber.

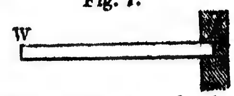
Under this head the author has minutely entered into the various strains to which beams of timber are submitted, and no part of the inquiry on the strength of materials is of greater consequence than this division, as the rules which are deduced teaches us to find the strength of brestsummers, girders, joists, rafters, engine-beams, &c. After having fully and minutely explained the different experiments made by himself and others, on the *laws of deflection*, and the breaking weight of timber, submitted in a variety of ways on timber, deals, planks, and battens, both of the best quality, and of a more common quality, he gives the following:—

"Determination of Practical Data."

[l the length, a the breadth, and d the depth of a beam, all in inches, W the breaking weight, and S the strength in lbs.]

"When the beam is fixed at one end, A, and loaded at the other, W, as fig. 1,

Fig. 1.



$$\frac{lW}{ad^2} = S,$$

a constant quantity for all wood of the same quality, whatever may be the length l, the breadth a, or the depth d; consequently, S once determined, remains the same, and serves for computing the strength of any sized beam of the same wood, or the dimensions necessary to ensure a given strength in a given direction. That is, of the four quantities l, a, d, W, any three being given, the fourth may be found thus,—

$$W = \frac{Sa \cdot d^2}{l}$$

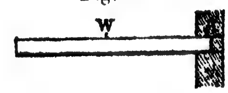
$$l = \frac{Sad^2}{W}$$

$$\left.\begin{array}{l} a = \dfrac{lW}{Sd^2} \\ d = \sqrt{\dfrac{lW}{aS}} \end{array}\right\} \text{In square beams } a = d = \sqrt[3]{\frac{lW}{S}}.$$

"*When supported at one end,* A, *and loaded in the middle,* W, *as fig.* 2,

$$\frac{lW}{4ad^2} = S. \text{ In this case, therefore,}$$

Fig. 2.



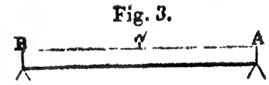
$$W = \frac{4ad^2S}{l}$$

$$l = \frac{4ad^2S}{W}$$

$$\left.\begin{array}{l} a = \dfrac{lW}{4d^2S} \\ d = \sqrt{\dfrac{lW}{4aS}} \end{array}\right\} \text{In square beams } a = d = \sqrt[3]{\frac{lW}{4S}}.$$

"*When the beam is fixed at both ends,* A B, *and loaded in the middle,* W, as fig. 3,

Fig. 3.



$$W = \frac{6ad^2S}{l}$$

$$l = \frac{6ad^2S}{W}$$

$$\left.\begin{array}{l} a = \dfrac{lW}{6d^2S} \\ d = \sqrt{\dfrac{lW}{6aS}} \end{array}\right\} \text{In square beams } a = d = \sqrt[3]{\frac{lW}{6S}}.$$

"*When the beam is supported at both ends,* A B, *and loaded at an intermediate point* W, *as fig.* 4, *the two equal lengths of the beam,* A W, B W, *are represented by m and n,*

Fig. 4.

$$W = \frac{lad^2S}{mn}$$

$$l = \frac{mnW}{ad^2S}$$

$$\left.\begin{array}{l} a = \dfrac{mnW}{ld^2S} \\ d = \sqrt{\dfrac{mnW}{laS}} \end{array}\right\} \text{In square beams } a = d = \sqrt[3]{\frac{mnW}{lS}}.$$

"*When the beam is fixed at both ends,* A B, *and loaded at an intermediate point,* W,

$$W = \frac{3lad^2S}{2mn}$$

$$l = \frac{2mnW}{3ad^2S}$$

$$\left.\begin{array}{l} a = \dfrac{2mnW}{3ld^2S} \\ d = \sqrt{\dfrac{2mnW}{3laS}} \end{array}\right\} \text{In square beams } a = d = \sqrt[3]{\frac{2mnW}{3lS}}.$$

"When the weight is uniformly distributed, the same formulæ will apply; but W in this case will represent only half the required or given weight."

The work contains similar formulæ on the elasticity of timber.

Mr. Barlow has given an extensive table, containing the results of numerous experiments on the elasticity and strength of various species of timber.

From this table we make the following extracts as *the mean result of experiments on the elasticity* (E) *and strength of timber* (S) *selected from the Dock-yard, Woolwich.*

Value of *E* and *S* is from the formulæ

$$E = \frac{l^3 W'}{32\, a\, d^3 \delta} \qquad S = \frac{l W}{4\, a\, d^2}.$$

The experiments were made on bars 2 inches square and 7 feet long, excepting in the second experiments, which were 6 feet long.

Name of Wood.	*Specific Gravity.*	*Value of E.*	*Value of S.*
Teak	745	301,800	2,462
Poon	579	211,200	2,221
English Oak	969	109,200	1,181
Do. No. 2.	934	181,400	1,672
Canadian Oak	872	268,600	1,766
Dantzic Oak	756	148,900	1,457
Adriatic Oak	993	121,800	1,383
Ash	760	205,600	2,026
Beach	696	169,200	1,556
Elm	553	87,480	1,013
Pitch Pine	660	153,200	1,632
Red Pine	657	230,000	1,341
New England Fir	553	273,900	1,102
Riga Fir	753	166,100	1,108
Do. No. 2.	738	123,800	1,051
Mar Forest Fir	696	80,670	1,144
Do.	693	108,700	1,262
Larch	531	77,040	853
Do. No. 2.	556	131,600	1,127
Norway Spar	577	182,200	1,474

The author proceeds to give a variety of experiments on the strength of timber bent and seasoned by steam, and also the resistance of columns to flexure. After having carefully settled the data, he gives the following

"*Solution of Practical Problems.*

"Having in the foregoing pages established the requisite data and formulæ for determining the dimensions of beams under every variety of transverse strain, it is proposed to give a few examples by way of illustration, in which I shall confine myself to the wood given in the preceding Table of Data, these having been carefully selected, and the experiments made with this particular object."

From these practical Problems (which are most valuable to every one connected with building), we select the following few examples.

"Problem I.—*To determine the Strength of Direct Cohesion of a piece of Timber of any given Dimensions.*

"*Rule.*—Multiply the area of the transverse section in inches by the cohesion per square inch (see Table), and the product is the strength required.

"In practice, the weight the timber has to support should not exceed one-fourth of the strength as calculated by the rule.

"*Example* I.—What weight will be required to tear asunder a piece of oak, 3 inches square?

In this case the tabular value	15000
The area of the section $3 \times 3 =$	9
The weight required	135000 lbs.

"*Example* II.—The diameter of a rod of ash being 2 inches, and its specific gravity 700, what weight will be required to tear it asunder?

The tabular value is	17000
The area of the section $2 \times 2 \times \cdot 7854 =$	3·1416
The product	53407·2 lbs.

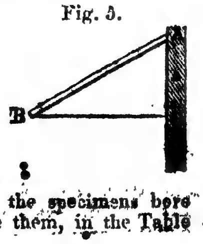
"*Note.*—If the weight be given and the area of section required, it is only necessary to divide the given weight by the tabular value of cohesion.

"Problem II.—*To find the Strength of a Rectangular Beam of Timber, fixed at one end, and loaded at the other.*

"*Rule.*—Multiply the value of S in the Table of Data by the area, and the depth of the section in inches, and divide that product by the leverage in inches, and the quotient will be the weight required in lbs.

"*Note* 1.—In case the beam is inclined, as A B, the leverage is the distance, B C, as fig 5. When the beam is horizontal, the leverage is usually called the length.

Fig. 5.



"*Note* 2.—In practice, the load ought not to be greater than one-fourth of the weight found by the rule; for permanent stretching or displacement of the fibres begins to take place as soon as the load exceeds about one-fourth of the breaking weight. This will be perceived by comparing the weights which the specimens bore without loss of elasticity, with the weights that broke them, in the Table of D ta

"*Note* 3.—If the load be distributed in any manner over the length of the beam, the horizontal distance between the point of support and a vertical line drawn through the centre of gravity of the load, must be taken for the leverage.

"*Example* I.—A beam projecting 5 feet over the point of support, is 6 inches deep and 4 inches in breadth of Riga fir, and is intended to support a load at its extremity; it is required to determine the greatest load it would bear, and the load it may be exposed to without injury.

"For Riga fir, $S = 1108$, and the area being $6 \times 4 = 24$, the depth 6 inches, the leverage 5 feet=60 inches, we have $\frac{1108 \times 24 \times 6}{60} = 2659{\cdot}2$ lbs. the greatest or breaking load; and $\frac{2659{\cdot}2}{4} = 664{\cdot}8$ lbs. for the load it would bear without injury.

"*Example* II.—A cistern to contain 36 cubic feet, or one ton of water, is to be supported by two cantilevers; the projection of the cistern from the face of the wall being 4 feet, it is required to determine the size for the cantilevers.

"Let the cantilevers be of larch, such as the 3rd specimen, then we find by the Table of Data $S = 1127$, and the depth 5 inches. The load on them will be 1 ton = 2240 lbs., and the weight will be uniformly distributed over the length; therefore, the distances of the centre of gravity from the wall will be half the length, or 2 feet=24 inches, which is the leverage. This is the reverse of the preceding operation on account of the weight being given.

$\frac{2240 \times 4 \times 24}{1127 \times 5} = 38{\cdot}2$ inches nearly, for the area of both cantilevers, or $\frac{38{\cdot}2}{2} = 19{\cdot}1$ inches for the area of one of them; and if the section be rectangular, the depth being 5 inches, the breadth will be 3·82 inches for each cantilever.

"Problem III.—*To determine the Strength of a Rectangular Beam of Timber when it is supported at the ends, and is loaded in the middle of its length.*

"*Rule.*—Multiply the value of S, in the Table of Data, by four times the depth in inches, and by the area of the section in inches, and divide the product by the distance between the supports, in inches, and the quotient will be the greatest weight the beam will bear in lbs.

"*Note* 1.—If the beam be not horizontal, the distance between the supports must be the horizontal distance.

"*Note* 2.—One-fourth of the weight found by the rule should be the greatest weight upon a beam in practice.

"*Note* 3. If the load be applied at any other point than the middle, it will be as the rectangle of the segments, into which the point divides the distance between the supports, is to the square of half that distance; so is the weight found by the rule, to the weight the beam will sustain at the given point.

"*Note* 4.—If the load be distributed in any manner whatever over the beam, the centre of gravity of the load must be considered its place, and its stress equal to the whole weight; unless part of such weight be sustained by the supporting points independently of the resistance of the beam.

"*Example* I.—Required the weight a beam of Riga fir, one foot square, would sustain in the middle, its length being 20 feet?

"In this case the tabular value of S is 1108, and the depth 12 inches, and the area 144 inches, the length 240 inches; consequently,

$$\frac{1108 \times 4 \times 12 \times 144}{240} = 32010 \text{ lbs.}$$

And the beam may be loaded in practice with $\frac{32010}{4} = 8002\frac{1}{4}$ lbs. without injury to its texture.

"If the load were applied at 8 feet distance from the end, instead of being applied in the middle, then it would be 12 feet from the other end; and by Note 3, we have $8 \times 12 : 10 \times 10 :: 8002\frac{1}{4} : 8336$ lbs. nearly, for the weight the beam 12 inches square would support at 8 feet from the end; showing the advantage of applying the load as far from the middle as possible.

"*Example* II. To determine the size of a girder of Riga fir for a warehouse, where the distance between the points of support is 18 feet,=216 inches, and the greatest probable stress at the middle, including the weight of the floor itself, 20 tons.

"The tabular number is

$$S = 1108, \text{ and } 20 \text{ tons} = 44800 \text{ lbs.}$$

Let us further suppose that the greatest depth of the timber intended for the purpose is 20 inches. By reversing the rule, we have

$$\frac{4 \times 44800 \times 216}{1108 \times 4 \times 20 \times 20} = 21{\cdot}83 \text{ inches}$$

for the breadth of the girder, which would be obtained by bolting together two pieces, each 20 inches by 11 inches; or much better by putting the two pieces at the most convenient distance apart, that would admit of both resting on the sustaining piece.

"If there be only 20 tons distributed uniformly over the surface of the floor, then a girder of 20 inches by 11 inches would be sufficient.

Similar practical Problems are given on the elasticity of timber, and to determine the dimensions of pillars, &c.

The cohesive power of stone and brick, with a table of the crushing force of various building materials, stone, brick, &c., is next considered.

The next division of the work is on cast and malleable iron. The author has given all the important experiments made by Rennie, Tredgold, Hodgkinson and himself, which are of that consequence as oblige us to consider of them hereafter, particularly the experiments made by Mr. Hodgkinson of Manchester, which were first published in the fifth volume of the "Manchester Memoirs:" they require the attentive consideration of the profession, as they are at variance with the rules laid down by Tredgold, and it appears to us that they are also at direct variance with the opinion of Mr. Barlow, as to the best form of rail for railways.

In conclusion, we cordially recommend this excellent work to the student; in it, he will find much to study, and a great variety of necessary and valuable information.

ORIGINAL PAPERS AND COMMUNICATIONS.

SUGGESTIONS FOR AN ARCHITECTURAL EXHIBITION.

Architects complain that they have not sufficient opportunity allowed them to exhibit their works, or rather designs, publicly; and when we consider, that of all the exhibitions of works of art in London, only two of them admit architectural drawings, this complaint will appear well founded. The two exhibitions which do admit such works, are the Society of British Artists, in Suffolk Place, and the Royal Academy of Arts, late of Somerset House, but now of the New National Gallery. *In the first, by looking over the catalogues of many past years, we find there have been never more than about a dozen in any one year or exhibition, and from the circumstance of these generally being badly placed, it is probable that they only found their way into the exhibitions* from accidentally being of such a size as would cover blank spaces left on the walls, after all the other pictures had been hung—not from any feeling on the part of the Society in favour of Architecture.

At the Royal Academy they certainly have devoted *nearly* one room for this purpose, but it is of such limited extent, that a very small portion only of the drawings annually sent can be placed.

When we take into consideration the large number of architects practising in London, and add the numbers practising in the provinces with their numerous artists and pupils, it may be fairly presumed, that if any encouragement were given, many, if not all, would be anxious to place their works before the public, so that a large and interesting collection would be annually obtained.

There is evidently a feeling abroad in favour of Architecture, which has been fairly proved by the interest excited in the public mind by the exhibition of the designs of the Houses of Parliament. Architects and their friends should not allow such excitement to subside, but make efforts to keep up the feeling, which can only be accomplished by their constantly bringing their works before the eye of the public.

If such an exhibition of drawings as that of the Parliamentary Buildings, nearly all in one style of Architecture, and all of only one subject, and by a very limited number of architects, created such a sensation, and so much discussion, there can be no doubt that an exhibition on a large scale of numerous subjects, in all styles of Architecture, and by a great number of architects, would at least tend to draw the attention of all classes to this delightful and important art.

It must be acknowledged, that the only way of reviving any real love and reverence for the art, is by a general diffusion of its principles amongst the people; and one of the best and most pleasing means that can be employed to draw attention to the subject, is a public exhibition of drawings, showing what has been done, and what the art and architects are capable of accomplishing.

By an exhibition of architectural drawings, it is not meant that they should be confined to mere elevations and perspective views of interiors and exteriors of buildings—but that all drawings, sufficiently well executed, should be admitted, on any subject connected with the art of design, if applicable in any way to architectural purposes. Furniture being so intimately connected with Architecture, should not be omitted. By way of encouraging young architects, certain subjects might be given them to exercise their talents upon, and the whole when done be exhibited, after being placed and numbered in order of their merit by competent judges; and to increase the interest and usefulness of such competitions, the judges should be bound to give briefly their reasons for choosing one design in preference to another.

By such comparative drawings and reasons, the public would see what really constituted good Architecture, and would be afterwards better able to give a proper judgment themselves when called upon to do so in any *real* competition for any public building. In fact, it would be a series of lessons in Architecture, which would be not only useful to the public, but a never-failing source for study and contemplation to the student.

Exhibitions on an extended scale would also be serviceable to the profession in another point of view, for architects could there place those of their designs which had been rejected in competitions, so that the public would have an opportunity of judging whether the best design for any building had been chosen; and the certainty that such an exhibition would be given to all the designs, would ultimately destroy the system of jobbing and trickery, so constantly practised in such cases. By including in the exhibitions designs of furniture, &c., the attention of the ladies might be drawn to the subject of suiting the style of their furniture, fittings, &c., to that of their houses; so that the effect of well-studied interiors might no longer be injured by the introduction of all kinds of incongruities in the shape of furniture.

Let us hope that all architects will combine to establish such an annual exhibition of their designs and drawings, entirely under their own control, as there can be no doubt but that it would not only tend to the improvement of Architecture generally, but would be beneficial to every individual member of the Profession.

EFFECT OF THE WIND ON THE SPEED OF LOCOMOTIVE ENGINES ON RAILWAYS.

The following observations were made upon the London and Greenwich Railway, with a view to determine the effect of the wind upon an engine and train of five carriages, against a strong wind from N.N.W. crossing the line of an angle of about 30 degrees.

The Engine "Royal William."

Diameter of piston 10 inches, 16 inch stroke, wheels 5ft. diameter.

Against the wind . .	$\frac{1}{4}$ mile in 40 seconds =	22 miles per hour.
With the wind . . .	$\frac{1}{4}$ mile in 36 seconds =	25 miles per hour.
Difference . . .	4 seconds	2 miles per hour.

Engine "The Walter."

Diameter of piston 11 in., length of stroke 18 in., wheels 5ft. diameter.

Against the wind . .	$\frac{1}{4}$ mile in 34 seconds =	26 miles per hour.
With the wind . . .	$\frac{1}{4}$ mile in 32 seconds =	28 miles per hour.
Difference . . .	2 seconds	2 miles per hour.

It is here seen, that the difference is not so great as many persons imagine; the quantity of steam used was the same both ways, the regulator being opened as nearly as possible to the same place: the difference is less in the last instance, the engine being of greater power, and the surface exposed less than the first, being without a tender.

A ready approximate method to ascertain the velocity of a locomotive, is to count the number of revolutions of the crank or driving-wheels (if 5 feet diameter) in ten seconds, the number given is the velocity in miles per hour. Thus, if making 30 revolutions, the engine or train are travelling 30 miles, and so on. If the wheels be 6 feet diameter, the number of revolutions in 8 seconds must be taken.

C.

DESCRIPTION OF MR. MITCHEL'S PATENT SCREW MOORINGS AS BEING NOW LAID DOWN IN THE PORT OF LONDON.

Communicated by J. Elmes, Esq., Surveyor of the said Port.

This sort of Mooring is constructed, as its name implies, on the principle of the screw, but differing essentially in form from that well-known instrument; for while the spiral thread makes little more than one turn round its shaft, it is at the same time extended to a very broad flange, the hold which it takes of the ground being proportional with its breadth of disk.

Where it is necessary to provide against a very heavy strain, Mr. Mitchel has moorings of 3 ft. 6 in. diameter, and the principle is capable of still further extension.

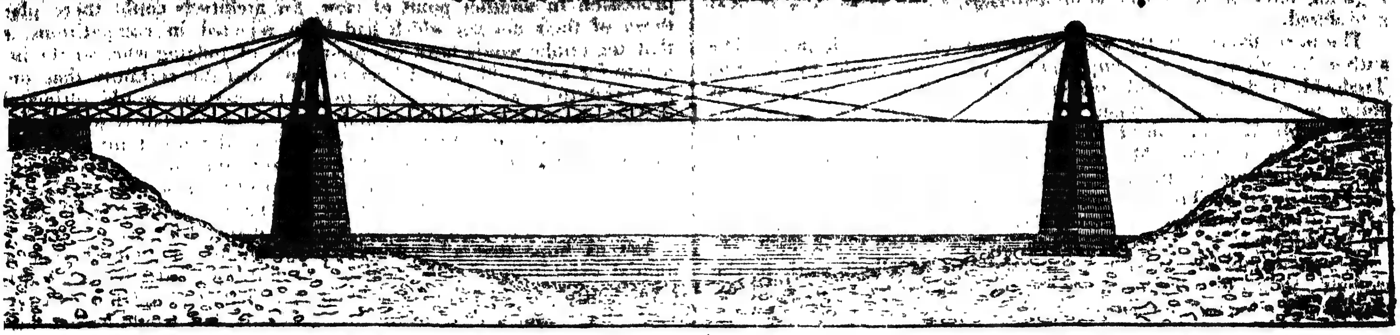
A mooring of the above diameter presents a resisting surface equal to about ten square feet; whereas the palm of the largest anchor in the British Navy does not exceed half that size; and some estimate of its holding powers may be formed, when it is shown that this broad surface can be screwed to a depth many times greater than that to which the palm of an anchor can ever descend.

The method of laying down the mooring is briefly thus:—A strong mooring-chain being so attached to it as to allow the screw to turn freely, without carrying the chain round with it, a powerful iron shaft is then fixed firmly in the upper part of the mooring, which is formed square for that purpose, setting in the same manner as a key to a harp or piano-forte in winding up: it is then lowered by the mooring-chain, joint after joint being added to the shaft till the mooring has reached the ground; light levers of 12 ft. in length are then applied to the shaft in the manner of a capstan, when the operation of screwing the mooring into the ground commences.

Two boats or barges having been moored firmly head and stern close alongside each other, and the upright shaft rising between them about midships, the men place themselves at the bars, and move round from one boat to the other, the two giving them a safe and convenient platform; by a simple contrivance the levers are occasionally shipped upwards, as the screw and shaft sink into the ground.

When the number of men employed can no longer force the screw round, the levers are removed, and the shaft drawn out of the ground, leaving the mooring firmly imbedded with the chain attached to it; a buoy being shackled to the other end of the chain the work is completed, the time required for the

CURTIS'S INFLEXIBLE SUSPENSION BRIDGE.



The principle upon which this bridge is formed, is, that at every point of support its stability is maintained *by four forces*, viz.—the two bars radiating from the centre of each pier, and the frame of the bridge itself, which frame being connected with the piers in such way as to retain only a vertical action, allowing the bridge full liberty to accommodate itself to the changes produced upon the radial bars by their expansion and contraction; at the same time, being confined in a horizontal direction, the inflexible frame becomes a beam, which may be resolved into two forces, acting towards and from each pier respectively, thus assisting to maintain the stability of the structure.

The result of this arrangement is, that the bridge will possess a degree of stiffness and solidity, wholly unattainable by the ordinary mode of constructing suspension bridges.

The frame of the bridge must be formed of timber, well framed together and bolted from side to side, so as to make it as stiff as possible; upon the inside of the pier standards are fixed vertical guides, which allow the frames to rise and fall in harmony with the contraction and expansion of the radial rods, as may be seen in the drawing.

COLUMN DE JUILLET.

Place de la Bastile, Paris.

This proposed magnificent Column, designed to commemorate the celebrated Three Days of July, 1830, is now rapidly progressing. It is being erected on an elevated spot at the eastern end of the Boulevards, the site of the celebrated prison of the Bastile, which was destroyed in 1789, in the early period of the French Revolution. The design first chosen for this noble monument was from the pencil of M. Alavoine, and the present admirably-contrived and well-constructed scaffold employed in raising the present building, was erected under his direction; this person dying in 1834, the business was placed in the hands of M. Lenoir, the present architect. The former plan not having met entire approbation, the latter gentleman was desired to prepare a new design, which is the one now in the course of erection. It will be a Corinthian column, entirely of bronze, standing upon a marble pedestal, the pedestal being surmounted by a colossal figure of a Geni: a staircase will be contained within the column, and a gallery formed above the capital, from whence a fine view of the City of Paris will be obtained. The column will be composed of 22 cylinders or drums, of bronze, each 1 metre, or 3.28 feet in height, and 3.75 metres, or 12.3 feet in diameter; these drums have an internal projecting flange on each end, through which they will be bolted together. The capital will be 1.60 metres, or 5.9 feet in height. The whole weight of metal employed in the construction will be 150.000 killograms (a killogram being equal to 2lb. 3oz. 3dr. 12gr. English). The cost price per killogram for the drums is 3.15 francs, and for the cornices, ornaments, &c., 4.5 francs. The whole estimate for the work complete was as follows:—

	Francs.
For the metallic part	650,000
The marble, &c. &c.	350,000
Total	1,000,000

It may be worthy of notice, that the site occupied by this erection was that which was chosen by Napoleon for the erection of the famous Fountain of the Elephant, the decree for which was dated on the 9th February, 1810, and it named the 2nd of December, 1811, as the day on which the structure should be completed. The foundation was laid in 1810, but to the present day nothing more has been done towards its erection; the model in plaster of Paris still exists within the enclosure, and near the spot where the fountain was to have been erected. This model will give some idea of the fine effect the fountain would have had; its enormous dimensions and fine proportions strike the spectator with admiration, and at the same time a regret that so grand a design should ever have been abandoned. On a recent visit to Paris, we saw the model, probably for the last time; it had lately undergone some necessary repairs, which, we were informed, were the last intended to be bestowed upon it; the shed which hitherto has covered and protected it from the inclemency of the weather is now removed, and if, as we were informed, no further measures are intended to be taken for its preservation, it *will not be long* before the visitor to Paris will merely hear of it as a thing that once existed.

COMMERCIAL DOCKS AT SOUTHAMPTON.

The importance in which Southampton was held in former times, is shown by the date of its charter, of the time of Henry the Second, and the extensive and exclusive privileges which it awarded.

Circumstances are again bringing this town and harbour into prominent distinction—it is computed, that more than 70,000 passengers embark in and land from steam-vessels of various classes at this port in the course of the year; whereas, until the introduction of steam-power to the purposes of navigation, the passage to and from Southampton by sea was confined to the few in their intercourse with the Channel isles, Guernsey and Jersey, or might proceed to and from the Isle of Wight, the usual passage being by Portsmouth.

The effect of the application of locomotive engine power to conveyances by land upon the more eligible harbours of the kingdom remains to be seen, but upon the face of things, it is evident that the maritime trade will be much more divided than it has hitherto been; and such is the force of anticipation, that Southampton is destined to participate largely in this change, as to have led to the establishment of the company, for the purpose of affording the accommodation of Commercial Docks, to be constructed precisely at the spot where the London and Southampton Railway ends, constituting in effect the most desirable and most valuable terminus conceivable to the railway, and at the same time presenting all the accommodation to the trade of the country generally which docks can afford.

It cannot be made too generally known, that the channel from the entrance of Southampton water to the town, being a distance of six miles only, is wide and deep, fully sufficient for any merchant ship to enter the Docks, which are at the foot of the town, unless drawing more than 16 feet water at any time of tide.

It may fairly be questioned, whether any port in the kingdom presents equal facilities for providing the accommodation required for trade, since there is a ready made plateau in which to form the Docks, extending over a surface of 208 acres of ground (exposed at low-water), bounded on two sides by a deep river, that is to say, on the south by the river of Southampton, and on the east by the river Itchin: east of these rivers is a natural and convenient basin, leaving the entire surface of the land applicable to docks and warehouses, the accommodation to be afforded by which may be rendered more than equal to the London and St. Katharine's Docks put together, as will be seen on a comparison of the area enclosed for those Docks, viz.—

London Docks	71	95 Acres.
St. Katharine Docks	24	

The Southampton Dock land will cover 208 acres, every acre being unexceptionable for the purpose in question, and leaving the unfettered judgment of the proprietors to lay out the whole, either for floatage, or warehousing, as the case may require.

The valuable evidence given before a Committee of the House of Lords upon the Bill for making these Docks, fully prove the advantage and necessity of them.

The value of the port of Southampton in a time of war is too forcibly proved, so that it would even justify the patronage of Government toward the Docks, as a measure intimately connected with the national interests; and when it is recollected, that the next war will be a war of machinery—a war, in which steam will produce effects as wonderful and as decisive over the methods and means of the last, as were produced in times past upon the first introduction of gunpowder to the art of war—and when it is remembered again that the peace and security of a nation is guaranteed only by its readiness to go to war, and its ability to carry it on, it is not I think giving to this view of the subject more than its due importance by saying, that it far outweighs every consideration of a mere commercial nature.

The Dock, first and immediately to be constructed, will contain an area of water covering 15 acres and a half—the quay line will be 4,200 feet—and the whole area of this portion of the land is about 50 acres, having upwards of 150 acres for other docks and the accommodation of trade, when required.

NEW STREET TO THE HOUSES OF PARLIAMENT.

Sir,—Perceiving in your first Number that you have noticed the fact of the Treasury having ordered a survey to be made of a line of street connected with my plan for the improvement of Westminster; upon which you remark "we are friendly to public improvements, but we think this is not required." Now as it is possible you may have spoken unadvisedly, I beg to refer you to the Report of a Committee of the House of Commons in 1832, which Report, first showing that the Committee, after a careful examination of my designs and estimates for "Improving the approaches to the Houses of Parliament and Courts of Law, and also for improving the immediate neighbourhood of Buckingham Palace," proceeds to state, "that there is another object of far greater importance connected therewith, the attainment of which must materially conduce to the health of those who reside in that part of the Metropolis." * *

"Upon this subject your Committee request the most serious attention of the House, and of the Government, to a Report made on the 6th of December last, by the Local Board of Health of the united parishes of St. Margaret and St. John, which leaves no doubt of the deplorable state of this part of the Metropolis, with regard to the want of any effectual sewerage, and the dreadful results which must inevitably occur from the pestilential and unwholesome state of the atmosphere in that neighbourhood. Your Committee also refer to the evidence of the Surveyor to the Commissioners of Sewers, who, with twenty-two years experience on this subject, declared, that it was impossible to afford any adequate remedy in the present state of the houses and buildings, but it would be very easy to do so, if improvements of the character contemplated by your Committee were carried into effect." * * *

"Your Committee have carefully examined this plan with reference to the following questions:—1st, Whether it would furnish an effectual sewerage for the greatest extent of ground; 2nd, whether it be the most economical and the most eligible plan which could be devised for improving the approaches to the Houses of Parliament, &c. And your Committee are of opinion, that the plan under consideration, extensive as it undoubtedly appears, *is the most economical and the most eligible which can be devised for accomplishing these objects.*" * * *

"Your Committee therefore strongly recommend to the House and the Government the adoption of this plan, as being, in their opinion, of essential importance to the salubrity of this part of the Metropolis, as materially improving the approaches to the Houses of Parliament and Courts of Law, and as rendering the immediate neighbourhood of the Palace befitting the station of its illustrious inmates."

I might add much upon the nuisances, the levels—part of the district being seven feet one inch below high-water mark—the property of the Dean and Chapter of Westminster, who are unjustly charged with perpetuating nuisances which in reality they are most anxious to remedy. The various plans proposed by other parties, who have evidently but a partial acquaintance with the *locus in quo*, or with the details of the whole subject—the folly of allowing the finest situation in the Metropolis to remain its disgrace—the danger and inconvenience of St. James's Park becoming a permanent public road—the facilities for carrying my plan into execution, and the large profit derivable therefrom (the Exchequer would benefit to the amount of £200,000 from the taxes upon the building materials used);—but as all this would trespass at too great a length upon the valuable columns of your Journal, and as the whole question will again be shortly before Parliament, I will only concur in the truth of your remark "that all new improvements in London are generally ridiculed, and that it requires the utmost patience and perseverance to carry them into effect," and subscribe myself, Sir, your well wisher,

49, Pall Mall, October 18th, 1837. WILLIAM BARDWELL.

ON THE RELATIVE MERITS OF WOOD AND IRON ROOFS FOR STOVES, CONSERVATORIES, AND GREENHOUSES.

The different opinions prevalent with regard to metal or wood for the roofs of houses designed for the culture of fruits, exotic and tropical plants, have led me to inquire into their comparative advantages, having had several years practical experience on the subject, which enables me to speak confidently on the result of my experiments, and the inquiries which I have made.

For more than eight years, I have had the management of his Grace the Duke of Northumberland's forcing and other houses used for horticultural purposes, constructed of wood and cast-iron, and so convinced am I of the superiority of wood, that I feel no hesitation in saying, that when their merits and demerits are ascertained, the erroneous ideas in favour of iron will cease to exist, and I have no doubt that there are many practical gardeners who will confirm the truth of the following observations.

Any persons having a knowledge of the expansion and contraction of metals, may form some idea of the expansion of a large iron roof, on a hot day during the months of July or August, and of the contraction on a severe frosty night: so great have I witnessed the action of the sun's rays in expanding the iron rafters and lights upon a hot day, that it has required two or three men to draw down the sliding-lights, and in an equal proportion have I seen the contraction during the intensity of winter, so much so, that large apertures have appeared between the rafters and lights, which admitted the external air to such an extent, that it required the strength of two fires and the flues heated to the greatest excess before the house could be raised three degrees of heat, and this in a house of not very large dimensions compared with the wood-roofed house I am about to describe.

The dimensions of the iron-roofed vinery was 40 feet long, 16 feet wide, and 9 feet high, with a pine pit in the middle, which very much reduced the cubical contents of the air to be heated.

The wood-roofed house was 50 feet long, 14 feet wide, and 14 feet high, without any pit.

With regard to fuel, the house with the iron-roof at 12 degrees below freezing point required the consumption of 6 bushels of coals, and unremitting attention during the night, or until 1 or 2 o'clock in the morning, at the same time the house with the wood-roof required only 3 bushels of coals to keep it to the same temperature, and no attention was required after 11 or 12 o'clock, when the fires were made up.

I also made a calculation of the number of squares of glass broken in each of the houses, and found a great many more broken in the iron than in the wood-roof, which I attribute to the expansion and contraction of the metal. The last calculation was made after having had the whole of the lights of both houses repaired in the autumn, and in the following autumn it cost nearly double the sum to repair the same number of superficial feet of glass in the iron-roof as it did in the wood-roof.

Moreover, I have invariably found that plants do not thrive nor look half so healthy in an iron-roofed house as they do in one of wood, the iron being so great a conductor of heat, produces the well-known injurious extremes of temperature; and I have always found it necessary to shade all metallic-houses in the summer, notwithstanding their being thrown open, as much as the doors and moveable lights would allow, to prevent the vines or other fruits, when they come in contact with the iron being scorched. I have also observed, that unless the iron-work is painted annually, the drip from the condensed vapour falling from the rusty or corroded iron injures and disfigures the foliage of the plants; in proof of which myself and three other gardeners witnessed last summer, the destruction of nearly the whole crop of grapes and foliage of the plants in a gentleman's hot-house in Kent, erected about five years ago, through not allowing sufficient ventilation, and I advised the gardener, to prevent the same thing occurring in a second house, to make some apertures through the back-wall, about a foot high, and 3 feet long, with a shutter fitted to each, and hung on hinges to regulate the ventilation: he did so, and succeeded in saving the crop.

I think I have fully shown the superiority of wood over iron in several most essential points, viz.—for the better growth of plants, and the saving of fuel, glass, and labour.

I am willing to admit, for lightness of appearance, the iron will have the advantage, but I am persuaded that if proper attention be paid to the formation of wood-houses, they would not be objectionable. I will describe the construction of one, which I think would combine every object required.

The first thing to be attended to, is to give the roof a sufficient inclination to effectually carry off the water and prevent drips, and secondly, to form the roof in the following manner:—

The rafters to be of wood, from 6 to 9 inches deep, and the section to be wedge-shaped (3 or 4 inches wide on the upper, and half an inch wide on the underside); the four sides of the lights to be of wood, the top 4 inches, sides $2\frac{1}{2}$, and bottom 5 or 6 inches wide; and the sash-bars, to prevent as much as possible the obstruction of the sun's rays, should be of copper, which will give the house a light and neat appearance.

I will add a few words to these observations, respecting the heating of buildings with hot water, which is now very generally adopted, and admitted to be the best, most economical, and certain method. The advantages of hot water over steam are several.—In the first place, for generating steam there requires an enormous consumption of coals (a weaker fuel will not do). Secondly, constant attention is necessary to keep up the fire. Thirdly, there is considerable loss of time before the pipes are filled with steam—as steam will not travel through the pipes until the pipe is heated nearly to the same temperature as the steam itself, for the instant it comes into contact with a body colder than itself, it condenses. Water, on the contrary, immediately it is heated in the boiler, circulates through the pipes, and distributes the heat immediately, and continues so long as there is heat in the furnace, which is not the case with steam, for the instant the fire becomes weakened, so as not to generate steam, that moment it ceases to furnish heat to the pipes.

I have devoted considerable attention to heating of houses with hot water, and after examining several plans, and tried numerous boilers, I have at length invented one, which I consider to be the most economical yet made. I have used it in some extensive houses on my own grounds and elsewhere, the drawings and descriptions of which I herewith send you: the smaller boiler (figures 1, 2, 3, and 4) is intended for houses of small dimensions, and the larger one (figure 5) for extensive houses. This latter boiler is circular, and only 2 feet 8 inches diameter across the bottom in the clear of the brickwork, and 3 feet high. During last winter I made use of this boiler; it heated 448 feet run of 3 and 4 inch iron-pipe, which warmed two large greenhouses or stores, 60 feet by 16 feet, and 60 feet by 14 feet; also two pits, 60 feet by 8 feet, and 60 feet by 6 feet—the whole was kept up at their respective temperatures during the severest part of last winter, without any difficulty, or burning a single bushel of coals, the only fuel required was cinders, or very small coke, with the refuse of cuttings from my nursery: at no time did it require more than four bushels of such fuel in 24 hours.

Sion Nursery, Beulah Spa. J. THOMPSON.

THOMPSON'S ECONOMIC EGG-SHAPED BOILER,

(Drawn to a Scale of half an inch to one foot.)

Fig. 1.—Elevation of Boiler.

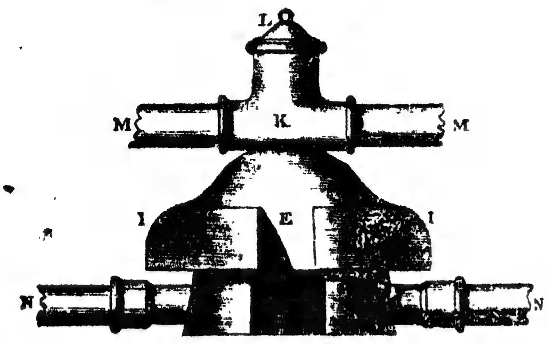


Fig. 3.—Longitudinal Section.

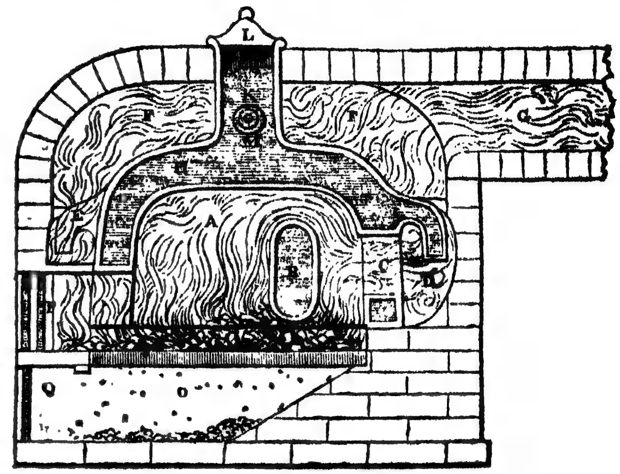


Fig. 2.—Transverse Section.

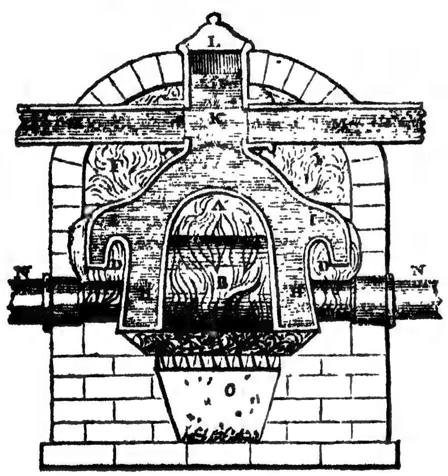


Fig. 4.—Plan of Boiler and Furnace.

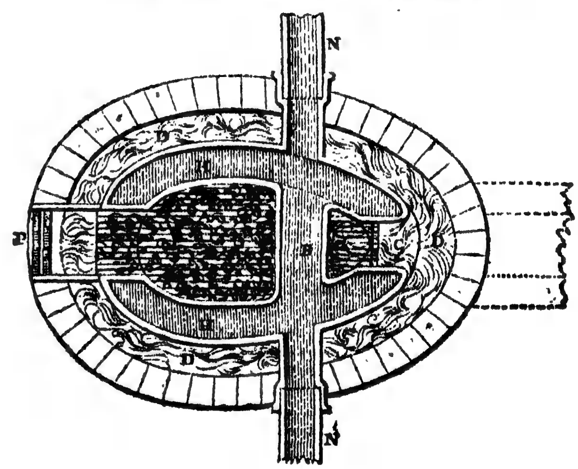
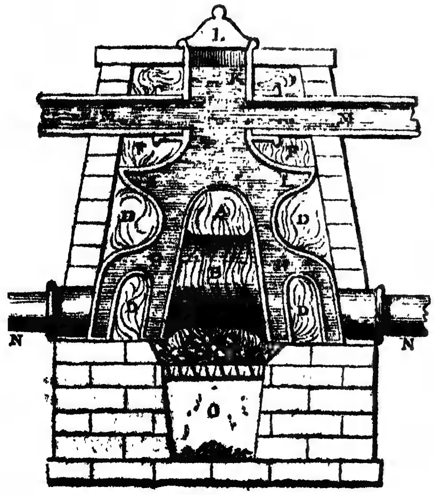


Fig. 5.—Section of Circular Boiler.



Description of Engravings.

Fig. 1 is the elevation of the front. Fig. 2 a transverse section across the boiler and furnace. Fig. 3 a longitudinal section through the centre; and Fig. 4 a plan of the furnace and lower part of the boiler. The same letters refer to similar parts in each figure.

A is the furnace in which the fuel is placed, entirely surrounded (excepting the under-side) with the boiler: B is a check-draft, over which the heat, flame, and smoke pass to a small aperture C, in the back of the boiler, communicating with the flues D surrounding the lower part, which unite and pass through an opening E in the flange over the furnace-door to the flue F, which surrounds the upper part, and terminates at the brick flue G, furnished with a damper to regulate the draft. The boiler H is in the form of an egg on the plan, with a chamber all round, connected by the check-draft B, and surrounded with the flange I, which divides the upper and lower flues: K is a cylindrical chamber on the top of the boiler, with an iron cap L, either fixed or loose, as may be required: M M are the two outlet pipes communicating with the upper part of the boiler, through which the hot water circulates; after passing to the outside of the brickwork, the pipes are ramified into two or three branches, as may be required for warming different houses, or separate parts of the building; N N are the two return pipes, which enter the lower part of the boiler: O is the ash-pit, with a door, Q, to regulate the draft: the furnace has double doors P to exclude the external air.

Fig. 5 is a section of a circular boiler, with an additional chamber and flue surrounding the lower part.

By reference to the drawing and description, it will be at once seen, that the advantages of this boiler are, the great surface that is exposed to the action of the heat, and the economical introduction of the check-draft and flange filled with water to divide the flues, instead of using stone or brick; and if the flue G be continued through any part of the building to be warmed, there will scarcely be a particle of heat lost.

SCIENTIFIC INSTITUTIONS.

Institution of Civil Engineers.

We have been favoured with a copy of the "*Minutes of Proceedings of the Institution of Civil Engineers, containing Abstracts of Papers, and of Conversation for the Session of 1837.*"

The liberality of this Institution, in allowing their Papers to be published, cannot be too highly commended.

"January 10, 1837.—James Walker, Esq., F.R.S., L., & E., President, in the Chair.

"The President, having called the attention of the meeting to the conversation on Cements which had taken place when they last met, requested Col. Pasley, who had made many extensive experiments on this subject, to give the meeting some account of the results at which he had arrived.

"Col. Pasley said, that his attention had been directed to the subject of Cements from reading in Smeaton's works that all water limes were composed of carbonic acid and clay; since, on dissolving these limes in carbonic acid, clay, of which brick could be made, was left. From this remark he had been led to make experiments similar to the following: he took two parts of chalk and one of clay. The chalk being pounded and mixed with the clay, balls were formed, which being burnt in a crucible, were ground and mixed as cements usually are. Some of these experiments failed, but he attributed their failure to his having used clay which was coarse and sandy; whence it appears that substances will unite when in the form of a fine powder which will not unite when in a coarser form. These experiments were made in the years 1829, 30, 31, and 32. Subsequently, in 1836, he repeated his more successful experiments, but without the same success; and he attributed their failure to the fact of the clay (the blue clay of the Medway) containing a greater proportion of carbonate of lime than it had contained five or six years before. Continuing his experiments, he found that *four* lbs. of dry chalk and *five* lbs. of the moist blue clay, fresh from the Medway, made the strongest cement, but he had determined many other proportions which set immediately under water. With cement made according to the above proportions, thirty-one bricks had been set out from a wall, one brick being added every day, omitting the Sundays.

"He had cemented bricks together, and he found in every case that the bricks gave way and not the cement. He estimated the breaking force at the joints at about 5,000 lbs. on the thirty-six square inches, the surface of the brick. On comparing the strength of this cement with the chalk mortar which had united some bricks more than thirty years, he was led to consider the adhesive power of his artificial cement forty days' old as at least twenty times the power of the mortar."

"January 31, 1837. W. Cubitt, Esq., V.P., in the Chair.

"'*Description and Drawing of an Apparatus designed by Mr. Mitchell for Boring Wells; by Mr. Mitchell, Jun., of Sheerness.*'

"This apparatus consists of a frame, similar to that of a pile engine, in which the rods are suspended; on one of the rods is a wheel fixed on a square spindle (through which the rod can slide), and turned by means of a pinion and crank; the axis of this pinion serves also to draw the rods, since they may be drawn up by a single rope, or by a tackle suspended to the top of the frame, the rope of the block passing round the winch. The auger is regulated in the cut by a screw and nut; thus the rods are always kept from bending in the hole, and the bore from getting out of the perpendicular. This apparatus is found peculiarly convenient in chalk, and when stones are met with; since in most cases, if the auger be sufficiently hard, the stones flash off in small chips similar to gun-flints.

"'*A Method of breaking Ice, by forcing it upwards instead of downwards; practised on the Herefordshire and Gloucestershire Canal in the Winters of 1834-1835 and 1835-1836; by Stephen Ballard, A.Inst.C.E.*

"Mr. B. places strong planks, covered on their upper side with sheet iron, in the front of a boat, so as to form an inclined plane pointing downwards, the lower end of which goes under the ice. The boat, drawn by a horse, is steered by a person walking on the shore with a long shaft attached to a pole projecting over the stern. It is believed that one boat, horse, and boy, would thus break much more ice than three boats worked in the usual manner.

"Mr. H. H. Price called the attention of the Institution to the importance of ascertaining what are really the constituent elements of Artificial Hydraulic Mortars and Cements: several memoirs have been read before the Institute of France on this subject, but they exhibit great discrepancies as to the principles of the formation of these cements. It is of the greatest importance to the engineer to know from the materials at hand how to make a cheap average hydraulic mortar.

"Col. Pasley remarked, that he considered 'Smeaton's Researches' as the only ones of value; the French philosophers had followed out many of his suggestions in great detail. Two systems appear to have been pursued in France, the one in which the substances are burnt previously to their being mixed, the other in which they are mixed in a state of minute division previous to their being burnt. The Aberthaw limestone used by Smeaton consisted of carbonate of lime and clay; *one* part of the lime from this stone and *two* parts of sand make a cement which sets very hard in time, but the joints must be protected at first by Sheppey or some similar cement.

"Mr. Lowe was of opinion that very much must be attributed to the presence of silica; this evidently played a most important part. Limes have exceedingly different qualities; two makers using the same quarry would produce very different limes; if lime is flare-burnt, that is, burnt at a white heat, all the carbonic acid is driven off suddenly; the properties of lime burnt at a slow heat will differ much from the properties of the preceding. The mechanical mixing is also of the greatest importance; the Barrow lime is a natural hydraulic lime, but it must be well beaten with water and silica or sand.

"Mr. Blunt, from America, gave, at the request of the Chairman, account of the system of signals which were employed in the geometric operations now carrying on in America."

"February 7, 1837.—The President in the Chair.

"The conversation on Artificial Cements being resumed, several members expressed their opinions on the causes to which the hardening of mortar was to be referred. Hydrate of lime is the basis of all mortars, but this will not make a water mortar, or cement, without the addition of metallic oxide. The addition of clay will effect this, but most clays contain a metallic oxide.

"Mr. Francis Bramah gave the analysis of Dutch Terras, of Basalts, and of Pouzzolana, according to the different experimenters; in all these there is a considerable proportion of iron; and the addition of any of these to hydrate of lime will make a water mortar. Thus it appears that we must carefully distinguish between a good mortar, and a good water mortar, or cement. Hydrate of lime is the basis of both. Good mortar depends for its excellence on the slow absorption of carbonic acid, and the slow absorption of this is, according to Tennant, the essential condition for good mortar. It is remarkable that, according to Pliny and Vitruvius, the Romans kept their mortar for three years, and it is now the custom among builders to bury mortar, or to keep it in a cellar; it is thus prevented from absorbing carbonic acid from the atmosphere, or, in other words, from being reconverted into limestone. According to some experiments of Tennant, it appears that mortar in 3½ years will regain 63 per cent. of the carbonic acid of which it had been deprived. The absorption of carbonic acid being the condition of mortar hardening, if it be used under circumstances such that this absorption cannot take place, as under water, some other material must be supplied, and the addition of a metallic oxide appears to supply the required element.

"With respect to an hypothesis of Kirwan's which had been mentioned as to the peculiar properties of iron and clay, Mr. J. I. Hawkins stated a singular fact which had come under his own observation, namely, that the rust of iron has a peculiar disposition to travel through moist clay; the rate of this transfer was in one case about *one* inch per month.

"'*On Locomotive Engines, and the means of supplying them. By Jacob Perkins, M.Inst.C.E.*'

"The object of this paper is to show how locomotives may be supplied. The practical defects of the present system of locomotives, arising from the furring up or bruising out of the tubes of the boilers, Mr. Perkins proposes that steam should be generated through the medium of surcharged steam. He states, that if a tube hermetically sealed be filled to $\frac{1}{30}$th of its contents with water, the steam arising from the water will not acquire sufficient elastic force to burst the tube, but will have a remarkable property of transferring heat. The steam being saturated with heat requires no more, and the tube being vertical, this surcharged steam becomes a floating agent through which the heat ascends its own levity, so that the *top* of the tube would become red-hot were it not immersed in water. The difference between pure and surcharged steam is, that surcharged steam gives up its heat without condensing it, whereas pure steam must necessarily condense as it parts with its heat. Mr. Perkins states that a boiler has generated steam on this principle under the action of a fervent heat during the last seven months, and without the least leakage or incrustation.

"Mr. Perkins then details the advantages which may be gained from the adoption of his principles, and proceeds to make some remarks on the manufacture of locomotives. He recommends the division of labour, that the engines should all be fac-similes, and each part be manufactured at the places best adapted for their production. The paper concludes with observations on the most effective application of steam; on the best velocity of the piston, and relative proportions for the diameter and length of the cylinder."

"Mr. Blunt, at the request of the President, then stated some facts respecting the American steamers. The double boats had been given up, and the average speed of the best boats was 15 miles per hour. One boat, whose length is 220 feet and breadth 18 feet, has an average speed more than the preceding. They had recently introduced a ferry-boat, which might, he conceived, be extremely serviceable in our rivers; in the Thames, for instance, where there are a great number of vessels. The boat had bows at each end, so that it could go either way, and rudders at each end worked by one helm; the boat is thus steered at both ends. The rudders are placed in a semicircular chamber at each end, and can be reversed round; they are worked by a chain passing round the wheel of both and crossing in the middle, so that the boat is brought about in the same direction by the contrary action at the two bows. The wheel and chain cannot get out of order, and the rudder begins below the water, so that the boat can go through the broken ice. Such a ferry-boat will go round without going her length, which is about 100 feet.

"Mr. Blunt had repeatedly gone a distance which he knew, from actual trigonometrical measurement, to be 74 miles in 5 hours. The boats completed the distance from New York to Albany, not less than 150 miles, in 10 hours. The speed of these boats, as compared with that of the boats in this country, is not to be wondered at, when it is remembered that the boats are built simply and expressly for speed. The Americans pay great attention to the form of their boats; the water is smooth; the engines are placed on the deck and the boilers on the wings; and they spare no expenditure of power provided speed can be obtained."

(To be continued.)

Specification of the Patent granted to Henry Booth, *of Liverpool, in the County of Lancaster, Gentleman, for certain Improvements in the Construction and Arrangement of Railway Tunnels to be worked by Locomotive Engines.*—Sealed December 3, 1836.

To all to whom these Presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Henry Booth, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are described and ascertained as follows (that is to say):—

My improvement in the construction and arrangement of railway tunnels to be worked by locomotive-engines, I declare to consist in the formation of duplicate tunnels near and parallel to each other, but with different and opposite gradients, there being in each tunnel one line of railway, instead of forming, as is usually done, one large tunnel with two lines of railway, both lines having the same inclinations or gradients; and the difference of gradients which I recommend for a general practice is after the rate of twelve to fourteen feet per mile (that is to say)—supposing the tunnelling to be effected be one mile in length, and which, on the ordinary construction hitherto adopted, would consist of one tunnel with two lines of way through it, and that on the ordinary plan the same would be formed on the level, I recommend the construction of two tunnels having each one line of railway descending twelve or fourteen feet in the direction of the moving traffic, which arrangement may be accomplished by raising one out of each duplicate tunnel, and depressing the other six or seven feet from the level line, each tunnel inclining twelve to fourteen feet in the direction of the moving traffic through the said tunnel. Or supposing the tunnelling to be effected be one mile in length, and that, on the ordinary construction hitherto adopted, it would consist of one tunnel with two lines of way, having each an inclination in the same direction of twenty-four to twenty-eight feet per mile, I recommend the construction of two tunnels; one of them (the descending line in the way of the traffic) having the aforesaid proposed inclination downwards of twenty-four to twenty-eight feet per mile, and the other (the ascending line in the way of the traffic) having an inclin tion upwards of only twelve to fourteen feet per mile, instead of twenty-four to twenty-eight feet, as it must have if the two lines of way are in the same tunnel; and the advantage of this arrangement and construction is, that the passage through the tunnel, when on the ordinary construction it would either be on the level or on the ascent, is eased and facilitated to the extent of twelve to fourteen feet comparative declination per mile, that is to say, to the extent of about one-half of the whole force of traction required to overcome friction on a railway. The object to be attained is an easy and quick passage through the tunnels; and as, from the moist state of the rails in most tunnels, the adhesion, and consequently the efficiency of the engine, will be very much diminished, it becomes desirable so to arrange the gradients of the line in the tunnels, by raising or depressing the contiguous portions of the railway, that the passage through the tunnels in each direction may be effected more easily than on the contiguous parts of the road.

By this arrangement it is not proposed to gain any ultimate mechanical advantage, because as many feet as the engine moves downwards (by altering the uniform line of gradients in the tunnel), it must either previously or subsequently move upwards on the open railway; but the advantage is, that you choose your ground, and it being doubly important that no delay should take place in the tunnel, and from the state of the rails, &c., the greatest difficulties presenting themselves at that spot, *I so arrange* the gradients of the tunnels and of the contiguous parts of the roads, that whether on a level or on an ascending line of country, only about one-half the resistance in traction shall be met with in the tunnel as on the open railway; the chances therefore are, that if a locomotive-engine (which is subject to so many casualties) fail in the journey, it will not fail in the tunnel.

Now, though I have named a difference in the gradients or inclinations in the duplicate tunnels of twelve to fourteen feet per mile, I do not confine myself to those exact proportions; one-half this difference would be preferable to no difference; the object to be attained by the adoption of my plan being so to raise or sink the contiguous portions of the railway forming the approaching lines to the tunnels, and the departing lines from the tunnels in each direction, and so to arrange the gradients in the duplicate tunnels, that the passage through the tunnels in each direction by locomotive-engines may be effected as far as depends on the levels or inclinations more easily than on the contiguous portions of the open railway.—In witness whereof, &c.

Enrolled June 3, 1837.

LISTS OF PATENTS GRANTED BETWEEN THE 28TH SEPTEMBER AND 26TH OCTOBER, 1837, BOTH INCLUSIVE.

Francis Hoad, of Demarara, but now of Liverpool, Esq., for "Improvements in making Sugar."—30th September; 6 months.

Jonathan Dickson, of Charlotte-street, Blackfriars-road, Engineer, for "Certain improvements in Steam-engines, and in generating Steam."—30th September; 6 months.

Thomas Clark, Doctor of Medicine, Professor of Chemistry in Mareschall College, Aberdeen, for "An improved Apparatus to be used in manufacturing Sulphuric Acid."—30th September; 6 months.

Joseph Whitworth, of Manchester, Engineer, for "Certain improvements in Machinery, Tools, or Apparatus for turning, boring, plaining, and cutting Metals and other materials."—5th October; 6 months.

Ovid Topham, of Whitecross-street, Middlesex, Engineer, for "Certain improvements in the construction of Sluice Cocks for Water-works, and which improved construction, of Cocks is also applicable to Steam, Gas, and other purposes."—5th October; 6 months.

John Loach, of Birmingham, Brassfounder, for "Improvements in Roller blind Furniture, and in the mode of manufacturing the same, part of which improvements are applicable also to other purposes."—5th October; 6 months.

John Thomas Betts, of Smithfield Bars, London, rectifier, for "Improvements in the process of preparing Spiritous Liquors in the making of Brandy; being a communication from a foreigner residing abroad."—5th October; 6 months.

Antonin Pieux de Riehl, of Vienna, but now residing at Beaufort Buildings; Strand, Middlesex, Engineer, for "Improvements in Steam-engines."—14th October, 6 months.

Thomas Vaux, of Woodford, Essex, Land-Surveyor, for "Improvements in tilling and fertilizing land."—14th October; 6 months.

Henry Quentin Tennesson, late of Paris, but now residing in Leicester Square Middlesex, Gentleman, for "An improved construction of the portable vessels used for containing Portable Gas, and of the apparatus or machinery for compressing such gas therein; and of apparatus or mechanism for regulating the issue or supply of gas, either from a portable vessel, or from a fixed pipe communicating with an ordinary gasometer; being a communication from a foreigner residing abroad."—19th October; 6 months.

Edouard Francois Joseph Duclos, late of Samson, Belgium, but now of Church Lancaster, Gentleman, for "Improvements in manufacturing Iron."—20th October; 6 months.

Henry Robinson Palmer, of Great George Street, Westminster, Civil Engineer, for "Improvements in giving motion to Barges and other vessels on canals."—20th October; 6 months.

John Frederick Grosjean, of Soho Square, Middlesex, Musical Instrument Maker, for "Certain improvements on Harps, which improvements are applicable to other Musical Stringed Instruments."—20th October; 6 months.

Miles Berry, of Chancery Lane, Middlesex, C.E., for "Certain improvements in the preparation of Palm Oil, whereby it is rendered applicable to the woollen manufactures, lubricating of machinery, and other useful purposes to which it has not hitherto been applied; being a communication from a foreigner residing abroad."—26th October: 6 months.

Miles Berry, of Chancery Lane, C. E., for "Certain improvements in machinery for heckling or combing, and preparing and roving hemp, flax, tow, and such other vegetable fibrous substances; being a communication from a foreigner residing abroad." 26th October; 6 months.

Meeting of Scientific Societies.

The Society of Arts and Manufactures........Wednesday, 1st November.
The Architectural Society....................Thursday, 6th November.
The Institute of British Architects..............Monday, 4th December.

LAW PROCEEDINGS.

COURT OF COMMON PLEAS.—Oct. 26th.

[London Sittings, before the Chief Justice and a Special Jury.]

THE DIRECTORS OF THE STANHOPE AND TYNE RAILWAY *v.* HARFORD AND OTHERS.

This was an action brought by the plaintiffs against the defendants for a breach of contract, and the cause of action arose in the following circumstances:—The plaintiffs had caused an advertisement to be inserted in the newspapers on the 9th of September, 1832, for the supply of 3,000 tons of cast iron rails, one-half at the rate of 30lb. and the other half at 40lb per yard, with the requisite quantity of chairs, rails, pins, &c., "to be made of the best iron, which, when worked, must be equal to No. 3 bar-iron, and the chairs to be made of No. 1 bar-iron." The advertisement was replied to by the defendants, who are extensive iron manufacturers, carrying on business under the name of Harford, Davis, and Company, of Bristol, and also near Newport, in the county of Monmouth. The acceptance of the tender, which was made by the defendants in the words of the advertisement, was dated the 20th of October, and it only remained to settle the pattern of the chairs, some railway companies using one description and others a different pattern. In the month of January following, after some correspondence, the pattern was agreed upon, and a gentleman was deputed by the plaintiffs to visit the defendants' works, for the purpose of seeing the description of iron to be used in the process of manufacture, in order to guard against mistake or deception. On his arrival in South Wales some of the furnaces were set to work, and he found that a quantity of refuse, or cinder iron, was introduced along with the mine or ore iron, and he accordingly objected to it, and ultimately gave notice to the defendants that the plaintiffs would not receive that description of manufacture. The plaintiffs had a communication with the defendants, protesting against the article of "cinder" being used, and two of the directors went down to repeat their objection. A very lengthened correspondence ensued, the result of which was, that the defendants presevered in manufacturing the articles in their own way, and notice was given them that the rails would not be received. The plaintiffs advertised again, and made a contract with another party upon the best terms they could, but the price of iron had in the mean time risen, and the present action was accordingly brought for the difference between the price stipulated in the contract with the defendants, and that actually paid by the plaintiffs. This loss they estimated at £8,081. The main question in the cause regarded the construction of the contract. *On behalf of the plaintiffs it was contended, that the defendants were required by it to furnish rails made only of pure or mine iron. The defendants' case was, that the terms of the contract did not preclude them from using a certain portion of cinder in the manufacture of the iron rails.* A large number of witnesses were produced on each side. Amongst those called by the plaintiffs were Mr. Bramah, Dr. Ewer, and Mr. Story, who stated not only that the terms "best iron" precluded the use of cinder, but that the cinder was positively detrimental to the quality of the iron; whilst, for the defendants, a considerable number of ironmasters, amongst whom were Mr. Guest and Mr. C. Harford, expressed a directly contrary opinion. On behalf of the defendants it had also been urged, that no binding contract had been completed between the parties, but that point, depending upon the construction of a lengthened correspondence, was reserved or the decision of the court below.

The Lord Chief Justice summed up, and left it to the jury simply to decide between the conflicting statements of the witnesses as to the construction of the terms of the contract. If they should be of opinion that the defendants, by persisting in their intention of using cinder in the manufacture of the rails which they contracted to furnish, had refused to comply with the terms of the contract, they must find their verdict for the plaintiffs; but if, on the other hand, they should be convinced that the "best iron" might be composed of a portion of cinder, and that consequently the defendants were only prevented from fulfilling their engagement by the conduct of the plaintiffs themselves, the defendants would be entitled to a verdict at their hands.

The jury returned a verdict for the defendants.

Railway Shares.—Last month, two actions were tried before Sir Charles Wethorell, the Recorder, involving questions respecting the sale of railway shares. The first cause, "England *v.* Seaton," was to recover the difference in value of certain Great Western Railway shares, which the plaintiff had contracted to take off the defendant's hands on indemnity from him, and in which a verdict was taken by consent for 100*l.* The second action, "Lawrence *v.* Biggs," was to recover back 21*l.* 7*s.* 0*d.* paid for Bristol and Gloucester Railway shares, in which a verdict was given for the defendant under the direction of the learned Recorder, who, during the whole progress of the case, had expressed an opinion that the plaintiff could not

recover, on the ground of the defendant being his authorized agent for the purchase of those shares, and effected the purchase in pursuance of his instructions.

Taff Vale Railway.—An inquisition was held at the Angel Inn, in the town of Cardiff, on the 12th ult., before the Sheriff of this county and a respectable jury, for the purpose of assessing the value of some premises required for the railway. The first case was that of five houses, gardens, and yards, at Newbridge, the property of Mr. John Williams, which he had valued to the company at the rate of 1,100*l.* Mr. Williams, had been offered by the company at the rate of 500*l.* for it. After hearing witnesses on both sides, the jury assessed the value at 420*l.*—The next case related to some coppice-wood, the property of W. Wills, Esq. For this property, the company had tendered 100*l.*, which was refused, and the jury assessed the value at 90*l.* In consequence of the amount awarded being less than the sum offered, the party will, under the Railway Act, be liable to pay half the costs of the inquisition, witnesses, &c.—*Merthyr Guardian.*

STEAM NAVIGATION.

"On the 14th ultimo was launched *the splendid new steam-ship, "Liverpool,"* which for a length of time past has been building for Sir John Tobin, at Humble and Milcrest's yard, in Liverpool. As a specimen of naval architecture, this is the most splendid we ever saw in the port of Liverpool. She is with one exception the longest in the keel of any ship laid down. She was built in a kind of dock made for the purpose, and for several days the workmen were busily employed in clearing away and preparing for the launch. The ways were laid down 90 feet beyond the usual length. The ship measures 240 feet in length from her figure-head to her traffrail, and 57½ feet over her paddle-boxes. She is 1,042 tons by admeasurement, but will carry a cargo of 1,500 tons; her depth of hold is 20 feet. When completed she will cost at least £45,000. She has occupied the builders 12 months in building. Her two engines are of 460 horse-power, and are now in progress of construction by Messrs. Forrester and Co., of Vauxhall Foundry, and will not be completed for some months. The model of the vessel is exceedingly elegant, and has been greatly admired; her figure-head is the full length figure of a man.

Launch of an Iron Vessel.—On Saturday last, the *Rainbow*, an iron steam-vessel, built for the General Navigation Steam Company, was launched from Mr. J. Laird's yard, Birkenhead. She is, with two or three exceptions, the longest steam-vessel built or building in this country, her dimensions being—length over all 213 feet; beam, within paddle-boxes, 25 feet; extreme width, 49 feet. She is divided into six compartments by five water-tight partitions, which entirely remove all danger of sinking in case of collision with other vessels; and if all the other advantages iron vessels possess are left out of view, the simple fact that in them these partitions can be rendered most efficient and secure will, we have no doubt, cause their general adoption, both for sea-going and river vessels. The *Rainbow* is now being fitted, by Messrs. Forrester and Co., with a pair of 90-horse power engines; and her cabins, which are of the most spacious and elegant description, being also in a forward state, we may shortly expect to see her at work, and have no doubt, from superior model and light draught of water, she will be one of the fastest steamers afloat. The *Rainbow* is the tenth vessel built by Mr. Laird with water-tight compartments; and we understand that he has now three other large ones building on the same principle.—*Liverpool Advertiser.*

The Gordon Steam Packet.—This splendid vessel, which was launched at Pembroke in August, has been fitted with two engines of 110-horse power each. Her armament has also been completed, and consists of 14 long 32-pounders, and two 84 pounders on circular sweeps. She will either steam or sail.

ENGINEERING WORKS.

RAILWAYS.

London and Birmingham Railway.—On the 16th ult., a farther portion of this railway was opened to the public from Box Moor to Penley Heath, near Tring, making a total distance of 31½ miles of railway now opened from the Euston square station. We observe on a portion of the line they are removing the longitudinal timber sleepers, and substituting granite sleepers, and in another part they are exchanging the chairs at the joints, for a new chair invented by Mr. Buck, the resident engineer; the rails in the other chairs are secured by wooden keys. We will endeavour, in our next Number, to give a drawing of the new chair, also an architectural description of the line now open to the public.

Great Western Railway.—It was stated that the railway from Paddington to Maidenhead would be open early this month; we connot see how it is possible to have it ready this side of Christmas.

Greenwich Railway.—The remaining portion of this line from High-street, Deptford, to Greenwich, is to be proceeded with immediately. It is stated that Mr. Macintosh has contracted to carry on the whole of the works that are to be done. The stone sleepers now on the ground are advertised to be sold, and instead of them it is intended to use longitudinal timber sleepers.

The Dublin and Kingstown Railway.—The stone sleepers are being removed, and longitudinal timber sleepers substituted; also the rails are being exchanged, and a heavier rail laid down instead.

Brighton Railway.—As the new session of Parliament approaches, so do the different Companies of the rival lines again begin to place themselves in battle array, and to all appearance there will be another effort to bring in next parliament, either Stephenson's or Mills's line. A meeting of the shareholders of the latter Company was held on the 29th ult., to consider the propriety of going to Parliament in the ensuing session. Mr. Stephenson has issued another Report (which was placed in our hands as we were going to press); the intention of it is to show, that Captain Alderson has drawn wrong conclusions as to the several points reported by him to the House of Commons regarding the "direct line" and his own line: to all parties interested, we recommend to them a perusal of the Report.

Manchester and Leeds Railway.—Contracts have been advertised for the works to be done in the neighbourhood of Rochdale, Littleborough, Horbury, and Wakefield. The works near Mills Hill, between Middleton and Oldham, are proceeding night and day; small waggons, drawn by one horse each, and constructed upon a new method, so as to contain three cubic yards of earth, are extensively employed, and they are found to facilitate the progress of the works in a material degree.—*Manchester Courier.*

Birmingham and Derby Junction Railway.—Contracts have been advertised for the works to be done in the neighbourhood of Stonebridge, Maxstoke, Kingsbury and Elford.

Great North of England Railway.—The contract for building the bridge over the river Tees, in the southern portion of the line, was let on the 10th ult. to Messrs Dees and Hoy, of Newcastle. Tenders were to be delivered in on the 31st ult. for making eight miles and a half of railway from Darlington to Birkly.

The London and Birmingham Railway Company have it in contemplation to apply for a bill next session to make a market at the Camden Town terminus.

Grand Junction Railway.—Tenders are required for buildings and works connected with the passenger station at Birmingham.

North Midland Railway.—Operations have commenced on a portion of the line little beyond Heath Common, near Wakefield.

Taff Vale Railway.—Tenders are required for a portion of work to be done on this line.

Leith and Edinburgh Railway.—This undertaking is now fairly begun, and some progress made in the cutting and embankment immediately below Warriston-crescent in a line with Scotland-street.—*Stirling Journal.*

Extension of English Railway line to Scotland.—At a meeting of the Merchants Company, held on the 16th ult., it was unanimously resolved, that a memorial should be presented to Government, urging upon them the policy of having a survey made, under the direction of the Ordnance, of the best line for a railway wherewith to connect the capital of Scotland with one of the great leading English lines now being constructed.—*Edinburgh Observer.*

North Union Railway.—The works on this line are at present making rapid progress at the Wigan end. The erection of two iron-bridges, one over Walgate and the other over Chapel, are now in progress, and they are expected to be an ornament to that town.—*Preston Chronicle.*

Manchester and Birmingham Railway.—At a special meeting of the Directors of this Company, held on Saturday, the 7th ult., John Urpeth Rastrick, Esq., was appointed engineer to the Company.

The Austrian Government has at length resolved on executing a double project of vast utility to its Italian possessions—that of establishing two railroads; one from Vienna to Trieste, and the other from Venice to Milan. A regular weekly steam-boat communication is already established between Trieste and Venice, and this station is to receive an adequate augmentation of its efficiency when the railroads are finished. The railroad from Venice to Milan is to be subdivided into three branch lines. The first, sixty-two leagues in length, will intersect the whole Lombard Venetian kingdom; the second, about the same length, will traverse Mantua, Lodi, the Milanese, and the whole of Lower Italy; the third, sixty-four leagues in extent, will traverse the rich vicinity of the Lake of Guarda, and pass the great towns of Brescia, Padua, Viconza, and Verona. It is calculated that the travelling rate of transit by the various branches of this railroad will be a mile in four minutes, including the requisite stoppages; and that the whole expense of the undertaking will be fifty millions, towards which twenty-eight millions have been already subscribed by Venice, and twenty-two by Milan.

Continental Line of Railroad.—The great conception relative to the establishment of a great continental line of railroad across North Germany is in progress of execution. The line of railroad in Belgium extends to the frontiers of France and Prussia, from Ghent to Aix-la-Chapelle. France is hesitating; but Prussia is opening fifty German miles of railroad, which will afterwards be extended to her capital. The Company of Railroads of the Rhine and the Weser have obtained the concession, and are setting to work upon it. Doubts and obstacles disappear. It was said, indeed, that in Germany the expense of railroads would be enormous, and the profits small; and the expense of 233,000 thalers per mile expended on the Belgian railroad was cited, with the trifling profit of 13 per cent. But these are easily answered. In Belgium they counted only on 70,000 passengers, yet they were obliged to make a second line to accommodate the increased number. In North Germany, too, the country is much flatter, and the cost per German mile will not exceed one-half of the expense in Belgium.—*Augsburg Gazette.*

Railroads in the United States.—From the statements of Professor Henry, at the late Liverpool meeting, it appears that there are now 1500 miles of railroads in active operation in the United States, and 2000 miles of canals. Upwards of 3000 miles more of railway are in progress, although they have been greatly interrupted by the late commercial convulsion.

The Grand Canal Tunnel at Coseley, near Bilston.—The Grand Canal Tunnel at Coseley, near Bilston, which forms part of another important work undertaken by the Birmingham Canal Company for the improvement of their navigation, was open to the public on the 6th instant. In the construction of this tunnel, care has been taken to obviate the delays and inconveniences experienced at narrow tunnels on many of the old canals. The waterway being 17 feet in width, and a horse towing-path being provided on each side, both horses and boats are enabled to pass through it either way uninterrupted at all hours; and the severe labour to which boatmen are subjected at narrow tunnels, in propelling their vessels by the process called "legging," is, as regards this tunnel, entirely superseded. By the completion of the new or improved line, of which the tunnel forms a part, the direct canal route between Birmingham and Wolverhampton has been further shortened four miles; and when the other works now in progress shall have been completed, the route will be equally short with the turnpike-road. The cost of the line now opened exceeds £65,000.—*Wolverhampton Chronicle.*

Severn Navigation Improvement Company.—A meeting of the shareholders of this Company was held on the 12th ultimo, at Worcester. In consequence of the difficulty of raising sufficient capital to carry the original intentions of the Company into effect, the plan for forming a ship navigation from Gloucester to Worcester, by making the River Severn 12 feet deep, was abandoned, and instead thereof, a resolution was carried for forming a new Company to obtain a bill for making the River Severn from Gloucester to Worcester, 6 ft. 6 in. deep, and from Worcester to Stourport, 6 feet deep with all necessary locks, weirs, and cuttings, for a barge navigation, agreeable to the Report of W. Cubitt, Esq.

Projected Line of Canal.—For some months past, parties have been actively engaged in the survey of a new line of canal, intended to connect the towns of Altrincham and Middlewick by a less circuitous line of traffic than that which at present exists. The distance by the present route of canal, between the two points, is about forty-four miles; and by the intended line, branching out of the Bridgewater at Altrincham, approaching within a couple of miles of the town of Knutsford, and joining the Trent and Mersey Canal, at Middlewich, somewhere about 26—thus would a saving of eighteen miles be effected in a distance of 44! The survey is going on very successfully; when that is completed, and the scheme itself wholly matured, the public will, we are informed, be made fully acquainted with the project.—*Macclesfield Courier.*

New Houses of Parliament.—Considerable progress has been made in the coffer-dam during last month; the bed of the river, the whole length of the dam, has been dredged, and nearly all the main piles driven.

Hastings.—A sea wall, 1,000 feet in length, is being built in front of the Priory Grounds, at Hastings, for Her Majesty's Commissioners of Woods and Forests. Messrs. Walker and Burgess are the engineers. Amount of contract under £2,000.

Kingstown Harbour.—Considerable works are in progress in the New Harbour. A new Steam Boat Wharf has been built for landing and embarking passengers at all times of the tide.

Hull.—A new Steam Engine Manufactory, to be named the *Cyclops*, is building for Messrs. Brereton and Vernon.

Swansea.—A Floating-harbour and Dock is immediately to be formed, under the direction of H. Habberly Price, Esq., Engineer.

Level of Felpham and Bognor, in the county of Sussex. Tenders are required for making a new Sluice, about 350 feet long, and the works belonging thereto.

Bury, in Lancashire. A Company is about to be formed for establishing Water-works to supply the town.

Falmouth Harbour.—The foundation stone of the Pyramid or Cone to be erected on the Black Rock, between Pendennis and St. Mawe's Castle, at the entrance of the harbour, was to be laid on the 30th ultimo.

Patent Screw Moorings, invented by Mr. Mitchell. The Committee for the improvement of the Port of London ordered six of these Moorings to be inserted into the bed of the river, between the collier tiers of Hanover Hole lower tier, and Mill Hole upper tier. The fourth was screwed into the bed of the river the 14th ultimo, by a curious windlass, and lengthening turn-screw, worked by 40 men.

Weymouth Pier.—The contractor has commenced the operation of driving the piles for forming and lengthening the new Pier.

Woolwich Dock Yard.—The wharf is being extended to a considerable distance into the River Thames, which will add a very large space to the Yard, the whole length of the Docks. The new River Wall fronting the wharf is being formed by first driving two parallel rows of piles, about 15 to 20 feet between, with a stage on the top. The mud and soil of the shore of the River is cleared away, and a solid foundation formed; the wall is then carried up, and faced with ashloring of Ranger's Patent Stone, cast in blocks, and backed up with concrete, about 15 feet thick. The concrete is composed of Thames ballast and ground stone-lime, mixed in small quantities (similar to cement) on the top of the stage, and as it is mixed, it is shovelled into its situation. The blocks for the ashlering are 9 and 15 inches thick, and 3ft. by 1ft. 6in. on the face; they are cast in moulds, and made of concrete. The face next the River is finished with a smooth and hard surface, as if it were polished. After the blocks are cast, they are spread over the wharf, and have to remain for some months to harden before they are allowed to be used. The top of the wall is capped with blocks of granite.

NEW CHURCHES.

[*We shall feel particularly obliged to Architects in the Country, to forward us the particulars of any New Churches that are building, the Number of Sittings, Dimensions on the Plan; if with Galleries, Vaults, Tower, Turret, or Spire; Brick or Stone Building: Architect's Name, and the Cost or Estimate; also similar information of any Public Buildings that are progressing.*]

A new Church has just commenced in Bunhill Row; the style is Gothic, with a tower and spire, built of brick, with stone dressings; there are vaults and galleries. Dimensions on the plan, 96 by 60 feet; accommodation for 1,000 to 1,100 sittings. J. H. Good, Jun., Esq., is the architect, and Messrs. Ward the contractors. The amount of tender does not exceed £4,100.

The new Church building in Pemberton Row, in the Parish of St. Bride's, Fleet Street, is a brick building, of a peculiar form, adapted to the site of ground on which it is building. There are to be two tiers of galleries, and a tower. Benjamin Shaw, Esq., is the architect, and Messrs. Hayward and Nixon are the contractors. Amount of tender £2,800

A new Church is to be built at Greenwich. Mr. Wild is appointed the architect.

Bishop Ryder's Church, at Birmingham; the first stone was laid August 10th. It will contain 1,574 sittings.

Fullwood, York, the first stone for a new Church was laid August 10th.

Trinity Church, Ettingshall, Staffordshire, was consecrated on the 23rd August.—The Church, School, and Parsonage, were erected from designs by Mr. Robert Ebbles of Trysull, near Wolverhampton. The Church contains 920 sittings, the whole of which are free, except four pews

Brereton new Church was consecrated on the 21st August.

Walsall Wood New Church—the Church, School, and Parsonage form three sides of a quadrangle, and have a peculiar and picturesque effect, being built over the mines; they are constructed in timber, braced and framed together as firm as a ship, painted black and white, in the style of the buildings of Henry VIII. and Elizabeth.

Priors Lee Chapel, Salop, having become greatly dilapidated, and the population of the neighbourhood much increased, the old edifice was taken down and a new one built, in a plain Gothic style; was consecrated on the 24th August.

Coleham, Shrewsbury. A new Church was consecrated here on the 25th August; the accommodation is for 812 persons. The building is of plain brick, with tower rising above principal entrance; interior measure 60 feet by 46, with elliptical recess for chancel. Estimate £1,835.

Bridgewater Church, erected by the munificence of Lady Bridgewater, at Whitchurch, Salop, and consecrated on the 30th August. A chaste and elegant structure; the principal front is of three divisions, faced with Grinshill stone. The portico is composed of two Ionic columns, and two antæ, surmounted by an entablature. Accommodation for 700 persons.

Falmouth. A new Chapel of Ease is here contemplated.

At Ash, in the Parish of Whitchurch, a new Church was consecrated on the 31st August. Accommodation for 300, which, with the Parsonage, was erected by subscription.—*Gentleman's Mag.*

New Church at Alveston, near Stratford-on-Avon, is about to be built, under the direction of W. Walker, Esq., Architect, of Stratford. The tenders were to be delivered on the 1st instant.

New Church at Downall Green, two miles from Ashton, in Lancashire; the first stone was laid on the 9th ultimo, by Lord Stanley.

Runcorn New Church. This spacious Church is fast progressing towards completion, and when finished, it will certainly be one of the most elegant structures of the kind in this country.—*Chester Gazette.*

New Church at Alstone, in the Parish of Cheltenham; the first stone has just been laid.

New Church at Blackburn, Lancaster; first stone recently laid.

New Church at O'Meath, in the County of Carlingford, Ireland; the first stone was laid last month.

Glasgow Cathedral. The magnificent plans for the restoration and improvement of this Cathedral, which have been submitted to the Town Council by Mr. Gillespie Graham, were highly approved of, and nothing is now wanting but the pecuniary assistance of Government.

North London Cemetery.—The grounds of this Cemetery, in point of situation and soil, is decidedly the best that could be chosen for such a purpose near London; it is situate on the high ground immediately adjoining the beautiful Gothic Church, designed by Lewis Vulliamy, Esq., at Highgate. Considerable progress has been made in laying out the grounds, building catacombs, and the boundary wall. A Chapel in the Gothic style is about to be built at the lower entrance to the grounds. Stephen Geary, Esq., is the architect.

Exeter New Cemetery was consecrated on the 24th August last.

Banbury.—A Catholic Church is now in progress, in the Gothic style, under the directions of Mr. Derick, of Oxford.

Australia.—On the 10th May last, the foundation stone was relaid of the Cathedral Church of St. Andrew, to be rebuilt on a site of ground in a different part of the town of Sydney, in consequence of the original situation proving inconvenient, through the changes which have taken place in the direction of the streets.

BUILDINGS AND PUBLIC IMPROVEMENTS.

Globe Insurance Office, Cornhill.—The architecture of the new building is now beginning to be developed; it is of the Italian style, and will form a very leading feature in the architecture of the city improvements, in the neighbourhood of the Bank. Philip Hardwick, Esq., is the architect.

Law and General Insurance Office.—A new building is being erected in Fleet-street for this Office; the front is of Portland-stone, in the Italian style, with Doric columns on the ground-floor. Thos. Hopper, Esq., is the architect.

Marine Insurance Office.—A building in Cornhill is being altered for this Office, with a new front; the lower part is supported by Ionic columns, and the upper part is composed of large windows in three compartments, with Corinthian columns supporting an entablature on each story. John Davies, Esq., is the architect.

Royal Institution, Albemarle-street. A façade of three-quarter Corinthian columns, surmounted with an entablature, is being added to the old front of this building. Lewis Vulliamy, Esq., is the architect.

A Jews Synagogue, in St. Helen's-place, is being built under the direction of John Davies, Esq.

Bath.—The Victoria Column and Fountain, which forms a very elegant and classic ornament to the entrance of the Victoria Park, are now nearly completed, and more than realize the expectation of all who saw and approved of them when in design only.—*Bath Gazette.*

Sir Walter Scott.—The foundation stone of the Monument, to commemorate the genius and virtue of the late Sir Walter Scott, was laid by the Lord Provost, in St. George's-square, Glasgow.

A splendid Monument is to be erected in St. Andrew's Church-yard, Plymouth, in honour of the late J. Northcote, R.A., being the birth-place of this celebrated painter.

A Monument is to be erected at Norwich, in memory of the late venerable Bishop of Norwich.

A new Receiving House for the Humane Society, in Hyde Park, is being extended, under the direction of J. B. Bunning, Esq.

Serjeant's Inn.—The new buildings are rapidly progressing under the direction of Sir Robert Smirke. One of the clauses in the contract require that all the joiners' work, as well as timber of the basement story, shall be *Kyanised*, and that the plates and all other timbers which are usually let into the brickwork are supported by projecting iron plates or shoes.

Fitzwilliam Museum.—The tenders for erecting the carcase of this building were delivered in on the 10th ult. Messrs. Bakers' tender was accepted. Amount near £36,000.

The anticipated increase of price on iron, which we announced through our correspondent a short time since, has been realized, as an advance on bars of sixty-seven per cent. is now quoted, and corresponding terms on that of pigs. But this is even only nominal, as the iron-masters will not receive any orders but what are subject to the terms at which it may be sold when shipments are made, which from their heavy demands they will not submit to any period but what is discretionary with themselves.—*Western Times.*

MISCELLANEA.

A new Description of Pump, invented by Col. Dandelin, and manufactured by Tonnar, at Namur, for raising water for the citadel of Dinant to a heigth of 300 feet, has been tried at Sambre, with complete success: only two men are required to work the Pump.

Improvement in House Painting.—A very simple method has lately been adopted to render the surface of paint perfectly smooth, and to entirely eradicate the brush marks; it is done by means of a small roller covered with cloth or felt, about 8 inches long and 2 inches diameter, worked in an iron frame on pivots, similar to the common garden-roller. The flatting coat by this method is made beautifully even, and looks exceedingly well.

GRECIAN ARCHITECTURE.—A lecture on Grecian Architecture was delivered on Thursday Evening last, before the Members of the *Tunbridge Scientific Society*, by Mr. W. J. SHORT.

The lecturer, after explaining the various speculations as to its origin, minutely described its peculiar character and beauties, illustrating the subject by numerous large drawings of the various Grecian temples.—He also critically examined the practice of the Architects of the present day in applying the Grecian orders to modern street buildings, and pointed out that the frontages of single houses are too limited for the proper exhibition of classical architecture.

One plan which he proposed to remedy this defect exhibits some novelty.

This plan is to have in all new streets *at intervals* long squares, and in such squares to have what he calls double-shops—that is, shops on the first story as well as on the ground story; thus, by having two shops, and two distinct dwellings in one building, with only one front to ornament, more effect could be obtained at the expense required only to decorate plainly two fronts.

In this design the lower shops would project and form a promenade to the upper ones, which might be shaded and protected from the weather by rows of columns, which would give a bold architectural elevation to these long squares; and by combining a number of houses together in this manner in one uniform whole, the comparison between them and our public buildings would not be so great as at present.

By dividing the population, ladies would be able to walk these upper streets or promenades and enjoy exercise and air, without being annoyed by the lower class, porters carrying loads, and other nuisances—more particularly as the upper shops would suit the light fancy trade, such as Milliners, Jewellers, &c.

As some trades, such as Linendrapers, require more room to show their goods than others, here they might have a lower and an upper shop: this circumstance, of being able to accommodate a large or small establishment, is in favour of this plan, as it would do away with the necessity of breaking the uniformity of street buildings.

At the end of these long squares a light arch might be thrown across from the upper promenade on one side to that on the opposite side, so that any person could go from one side to the other without descending into the lower street again.

These arches would have the effect of breaking the long lines of buildings, at the same time leaving enough to be seen to raise the anticipation of the stranger, from which he would be able on ascending them to obtain a new and varied view of the whole scene.—*Maidstone Gazette*, October 3rd, 1837.

Brick and Cement Beams.—A fresh series of experiments have been trying lately at the Royal Engineers Establishment, Chatham, by authority from the Board of Ordnance. Three experimental brick beams, each resting on piers of brick, were constructed and broken by weights, which were applied over the centre of each. The piers were 2 feet 6 inches high and 18 inches square. The beams were 10 feet long, of the same width as the piers, and 1 foot thick. No. 1 beam was built of pure cement. No. 2 was also built of pure cement, with the addition of five longitudinal pieces of hoop-iron, one of which was in the centre joint, and two others in each of the remaining joints. No. 3 was built with mortar, composed of three parts clean sharp sand, and one part of Halling lime, and had also hoop-iron in the joints. The wood work for supporting Nos. 1 and 2 was removed in nine days, and that for supporting No. 3, in six weeks after they were finished. No. 1 beam was broken down, but it yielded sooner than it was expected; but it proved that for buildings where beams are usually used it may be safely applied. No. 2 also was a satisfactory experiment. No. 3 was tried on Saturday. The object of the experiment was to ascertain the use of cement-bond in the walls of buildings, as a substitute for bond and chain timbers; and also for ascertaining what additional strength is added to the bond by using hoop-iron in the joints. Mr. Brunel first tried some very interesting experiments, proving the extraordinary strength of brickwork laid in pure cement, with hoop-iron in the lower joints, but the same thing had not been tried without hoop-iron, which led to the experiments under Colonel Pasley.

No. 1 beam was broken with a weight of 208lbs.; the break was not in the centre, but extended in two vertical seams, the one about 6 inches, the other 18 from the centre.

The strength was in favour of the cement, for in no direction did it give way; but, on the other hand, the bricks were rent with an even fracture.

Another experiment was then made with the largest piece remaining, which measured about 4 feet over the piers: this required a weight of 2356lbs., and the fracture was similar to the former.

No. 2 beam was tried on the next day, and was found capable of supporting 4723lbs., but gave way on the addition of 56lbs. ∴ 4723—498 (weight required without the longitudinal bonds) = 4225, the amount of strength gained by the use of iron bonds.

No. 3 gave way with a pressure of between 400 and 500lbs. There was nothing remarkable in this experiment.

The above experiments were necessarily imperfect, the power not being applied as it would be in practice; for it is evident, that with a wall of from 10 to 15, or even 20 feet of solid work, the pressure, instead of acting merely on the centre, would be diffused throughout the whole beam. Upon clearing away the bricks from the middle of No. 2 beam, the two lower bars were found drawn asunder, the middle one remained of the same length, and the upper pair found, what is called buckled, or folded on themselves, showing the neutral centre to be in the middle bar.

We may take this opportunity to observe, that the foundations of the new Judges' Chambers, in Chancery Lane, are being constructed after the manner of the beam No. 2, having a length of hoop-iron to every row of bricks, and bedded in Roman cement.

On 14th ult., some further experiments were made by Colonel Pasley at Chatham, in the presence of the heads of the Naval and Military Departments there, and many scientific gentlemen, upon the strength of cement. The first experiment was to ascertain whether a safe staircase might be made with artificial stones formed with bricks and tiles, or other small materials united with pure cement, strengthened by hoop-iron bond.

A portion of the brick beam used in No. 2 experiment, in length 4 feet 4 inches, was inserted 9 inches into the wall of a stable; it consisted of four courses (two more than is used in a geometrical staircase); the extreme end of this step had no support whatever, so that we had the novel exhibition of a horizontal column of brick retained together by cement and iron bars. Being loaded, it sustained the weight of 3606 lbs. Beneath the extreme end of the beam was placed a block to break the fall; when the weights were removed, and the block withdrawn the column remained at the angle at which it fell, and required great purchase to remove it finally from the wall. Not one of the iron bars had given way.

The second experiment was for the purpose of ascertaining the force with which the hoop-iron strengthened the brick beams, by weights acting on a piece of hoop in a state of tension. In this case a piece of hoop-iron, 12 inches long, similar to that used in the above experiment, sustained a weight of 6163 lbs., then yielded with a fair fracture; it was elongated $\frac{7}{8}$ of an inch, and its temperature sensibly increased.

The third experiment was upon the remaining portion of the brick beam, built with Halling lime mortar, and strengthened with hoop-iron, which was broken on the 28th ult., but one end of which was little injured. This beam was placed across two piers two feet asunder, so that the bars had very little room for extension; the experiment, however, was remarkable, for the beam sustained the weight of 4887 lbs. It did not give way suddenly; two bricks fell from the lower course many minutes before the final crash, and this did not occur until it had been yielding with a slow, gradual motion. The fall was so tremendous that one of the piers were overturned, and scarcely two bricks were found together. So much for mortar. None of the bars were broken in this experiment.

It appeared in these experiments that the iron was corroded in the mortar, but not in the cement, another security of the latter over the former.—*Mechanics Mag.*

Rotatory Steam-Engine—Mr. Ruthven has now got the rotatory engine upon Avery's principle erected, and we saw it in motion on Wednesday. Having described it before, we shall merely observe at present, that it moves by the re-action of high pressure steam, which rushes through two small orifices at the opposite sides of two hollow arms, and impels them in a circular direction with incredible velocity. The engine has neither piston, cylinder, beam, crank, nor valve. The arms are of two feet six inches radius, and as they perform about 3,000 revolutions in a minute, their extremities must move at the rate of a mile in eight seconds. This very high velocity, or something approaching to it, is essential to the working of the engine. No noise is heard when it is in motion, but only a low humming sound like that of a boiling kettle. The trial on Wednesday was merely to show its mode of operating, but it is soon to be employed in some heavy work which will test its powers, and we shall then speak of it more at large. If its capabilities correspond to the inventor's description, it will deserve to be considered one of the happiest applications of steam power which has ever been given to the world.—*Scotsman.*

New Mines of Coal have recently been discovered at Hanarechang and at Bidgegur, in the south eastern corner of the Mirzapore district, said to be superior to the coal of Burdwan. This discovery will probably form an important era in the history of steam navigation in India.

Coal Mines in the Isle of Man.—These mines are about to be worked by a company with a capital of 6,000*l.*, which they assume to be sufficient for that purpose.—*Cumberland Pacquet.*

The Iron Trade.—Never were the prospects of this trade more cheering than at present. Orders are daily flowing in, and the price of the metal is consequently on the increase. We have it from good authority that 9*l.* per ton has been refused by some of the large masters for bar iron.—*Monmouthshire Merlin.*

Large cargoes of iron are now weekly exported from Ulverston to Antwerp. This may appear singular to those who know of the richness in this mineral with which the Netherlands abound; but it ought to be more generally known, that the finest iron in the world is that produced from the ore of our neighbourhood.—*Kendal Mercury.*

TO CORRESPONDENTS.

WE thank our numerous Correspondents for their suggestions—we request of them patience, and if it be possible to meet with their wishes we will do so. We have met the suggestions of several Correspondents, and so arranged the work, that the last page of No. 1. may be cancelled when the volume is completed, and bound up;—we will make a similar arrangement in future Numbers, so as to prevent the Advertisements appearing in the work when bound. In the present Number we have added two additional pages of matter, and a wrapper: if we are supported by a liberal supply of Advertisements to pay for the additional expense, we will continue this arrangement.

We regret that we have been obliged to disappoint several Subscribers in the Country, in consequence of the Stamped Edition not being allowed to pass the Post Office: we will endeavour to remedy this evil, if possible, before our next Number is published.

BOOKS RECEIVED.—Examples of Gothic Architecture, by P. L. Walker; 2 Parts large paper, with plates.—Music of the Eye, or Essay on the Vitruvian Analysis of Architecture; by Peter Legh, Esq., M.A.—Essay on the Construction of Ships and Vessels, and an Account of H. Barbe and Stuard's Patent. This Patent has expired too long for us now to notice it; besides, it would lead us into an endless controversy on the subject.—Artificer's Lexicon, by John Bennett.—Samuel Hall's Address to the British Association.—Complete Book of Trades, by Bennett and others; 8vo. plates. A useful work for children.

BOOKS received, which will be reviewed in our next Number.—Sundry Pamphlets on Kyan's Patent.—Warming and Ventilation of Buildings, by C. J. Richardson, Architect.

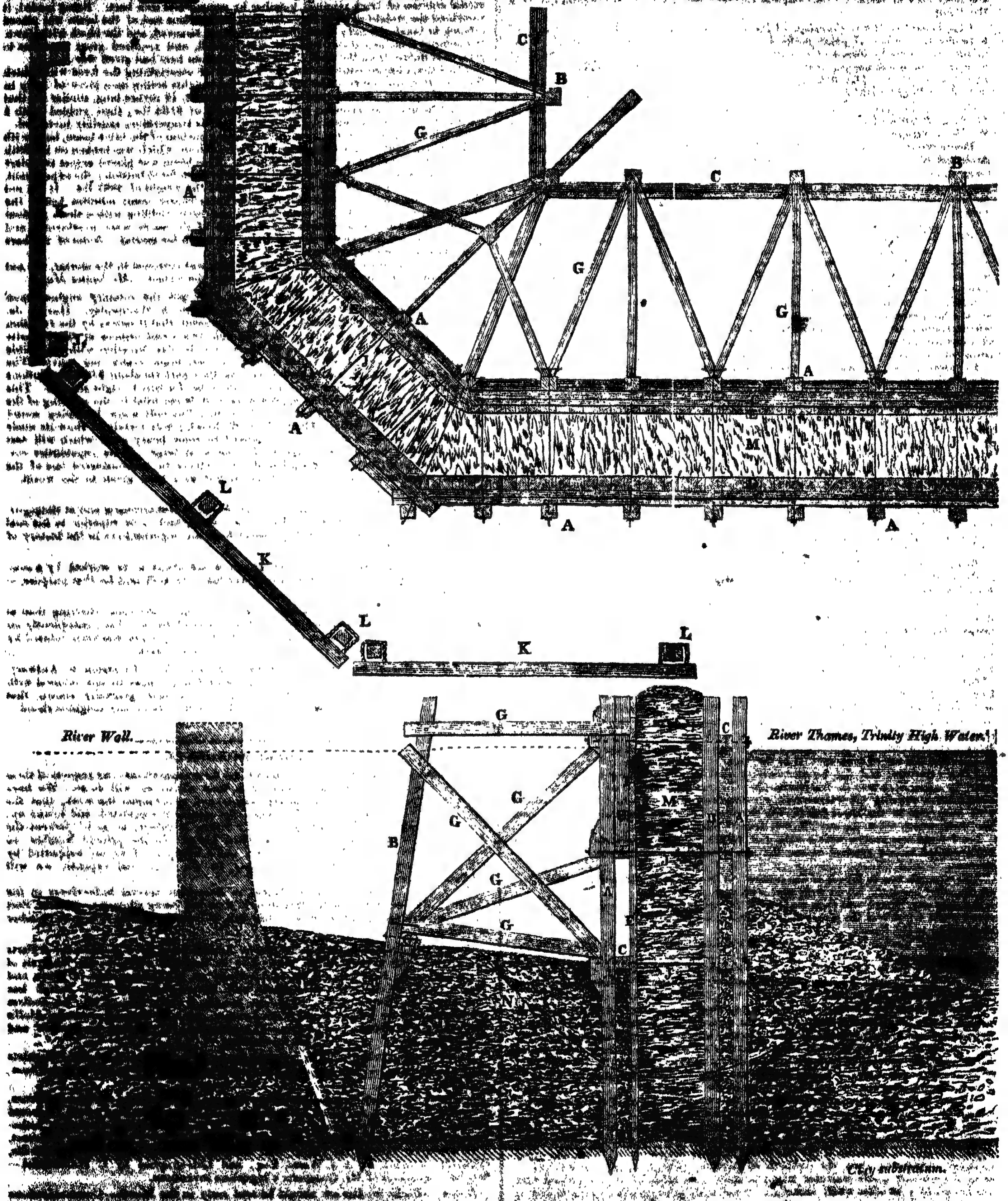
Engravings and Lithographic Drawings received.—Restoration of the Roman Forum, drawn by S. Walker, Architect, of Nottingham.—Lithographic View of the Projected Improvements in Westminster, designed by Wm. Bardwell, Architect.—A Lithographic View of the Cathedral Church at Wells, drawn by P. L. Walker, Architect. A Lithographic View of the Isle of Man Building Company's new town, Woodville, spiritedly sketched by A. J. Watts, Esq., and Lithographed by C. Hullmandel.—Several Engravings of Mr. Gompertz's ingenious inventions.

Notices.—Books for Review should be sent early in the Month—Communications on or before the 20th—and Advertisements on or before the 25th Instant.

HOUSES OF PARLIAMENT.

(For General Description and Plan, showing the extent of the Works, refer to page 12, No. 1, Journal.)

Figs. 1 and 2.—PLAN AND SECTION OF THE COFFER DAM.



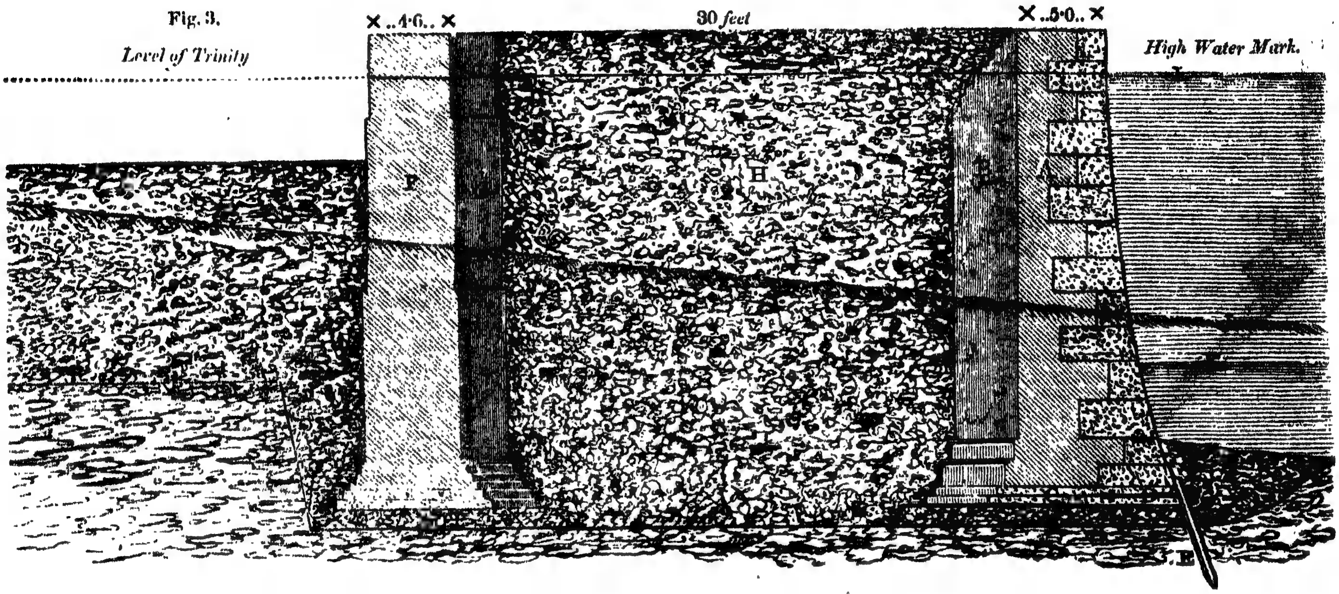
DESCRIPTION OF THE COFFER-DAM.

Fig. 1 is the plan of the coffer-dam, and Fig. 2 the section; the letters in both figures refer to the same descriptions.

A A Main Piles, } not less than 12 inches square.
B Brace Piles,
C Wales,
D Sheet piling to outer row, not less than 12 inches thick.
E Ditto to inner row, not less than 6 inches thick.
F Planking top of ditto, ditto.
G Braces and ties, 12×6 inches.
H Furring.
J Iron ties or bolts, 2 inches diameter.
K Booms, } 12×12 inches.
L Fender piles,
M Puddle, 5 feet wide in clear of the piles, of good stiff clay. The bottom of the river above the line N is to be dredged. The slope against the piling is to be formed as directed in specification. The bed of the river is gravel, and the substratum clay, into which the points of the piles are driven 2 feet. The wall indicated in feint lines, is the site of the river wall as shown in the figure below, marked A.

SECTION OF RIVER WALL, FRONT FOUNDATION WALL, AND CONCRETE BACKING.

Fig. 3.



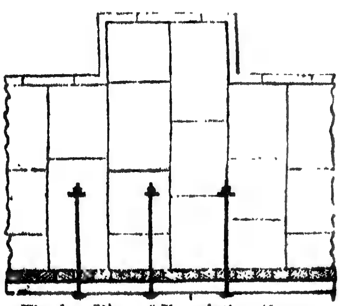


Fig. 4.—Plan of Foundation Course.

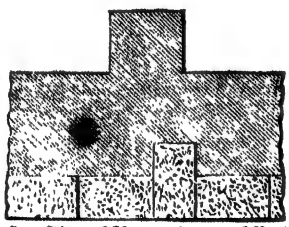


Fig. 5.—Plan of Upper Course of Footing.

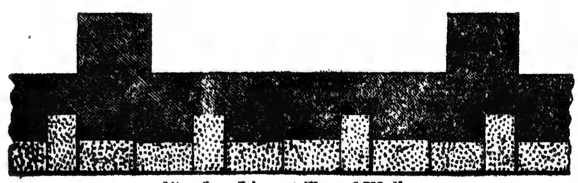


Fig. 6. —Plan at Top of Wall.

DESCRIPTON OF THE ABOVE.

Fig. 3 is a section of the terrace, marked c in the general plan, showing the river wall and front wall of the building, also the concrete foundation.

A is the river wall faced with granite, as described in the specification, 7 ft. 6 in. thick above the footings, and 5 ft. thick at the top: the two lower courses above the stone landings are 1 ft. 3 in. high; 3rd course, 2 ft. 2 in.; 4th and 5th courses, 2 ft. 1 in.; 6th and 7th courses, 1 ft. 11 in.; 8th and 9th courses, 1 ft. 10 in.; 10th and 11th courses, 1 ft. 9 in; 12th and 13th courses, 1 ft. 8 in. high each; and the top course, 1 ft. 8 in. high; total height of the wall above concrete foundation, 28 ft. 6 in.

B counterforts, shown in fig. 5 and 6, projecting 3 ft. 4½ in. from the inner face of wall, and 3 ft. 9 in wide.

C Two courses of 6 in. stone landing for foundation, bedded on 1 ft. thick of concrete; the lower course of stone is 11 ft. wide.

D Iron tie to secure the walling.

E Sheet piling, 8 ft. long and 8 in. thick, to protect the foundation.

F The foundation wall to front of building, 5 ft. 3 in. thick, above the footing, and 4 ft. 6 in. thick at the top, with two courses of stone landing; lower course, 8 ft. 4 in. wide, bedded on 1 ft. of concrete as river wall.

G Counterfort projecting 2 ft. 4 in. from the face of wall.

H Concrete backing; the whole space between the river wall and front foundation wall is to be filled in solid with concrete 30 ft. in clear of the walls, and 26 ft. 9 in. high, forming the terrace marked c, in the general plan.

JJ is a line showing the present surface of the bed of the river.

K Low water mark.

L High water, Trinity standard.

M Concrete foundation 12 ft. thick over the whole site marked B in the general plan; the top of the concrete is 4 ft. 6 in. below the high water Trinity standard; a similar foundation of concrete, 20 ft. thick, is to be made over the whole site marked A A in the general plan.

Fig. 4. Plan showing the foundation course of 6 in. stone landings, and the iron ties 4 ft. apart, to secure the wale and sheet piling.

Fig. 5. Plan of the upper course of footing, showing the stone-work and one counterfort.

Fig. 6. Plan at the top of the river wall 5 ft. thick, showing the stone facing, and two counterforts which are 10 ft. apart from centre to centre.

(Scale of Drawings, 10 ft. to one inch.)

SPECIFICATION OF THE RIVER WALL, AND OTHER WORKS CONNECTED THEREWITH.

Messrs. Walker and Burgess, Civil Engineers.—Charles Barry, Esq., Architect.

COFFER-DAM, &c.—Before the pile driving is begun, a trench is to be dredged in the intended line of the coffer-dam, to the depth of three yards below the level of low water, of 16 feet under the high-water of Trinity standard, and of such width as is necessary to allow the piling of the dam to be got in clear of the side slopes.—The coffer-dam is to be constructed of good and suitable Memel or Dantzic fir timber, of the scantlings and dimensions specified in the drawing.—The guage piles are to be of length sufficient to be driven to the depth shown, or such other depth or depths as may be necessary, so that the points may be at least two feet in the clay.—The wales are to be in two thicknesses, of half-timbers, breaking joint properly, and bolted to the guage piles, except at the returns; the wales on the splay or angle of which are to be of whole timber, in one length, laid over the waling of the sides of the dam, and secured to it by a strap passing round the same, with bolt ends through the wale above, and to be also bolted to the guage piles as before, with a cleat or strut to block out the angle ones.—The sheet piling is to be of whole timber in the outer row, and half timber in the inner row, and is to be driven with a close joint to the depth that has been stated for the main piles, and to be secured to the wales with inch bolts, one to each pile. The inner row of sheet-piling is to come up to the level shown, and the height above is to be made up with horizontal pieces, bedded down on the tops of the sheet piles, which are to be cut off level to receive them, and secured with three-quarter inch bolts to furring pieces inserted above the waling at each guage pile, and strapped thereto. The sheet piles in the angles, at the returns of the dam, are to be splayed on the edges so as to be fair and close with the square edges of the adjoining piles.—The brace piles are to be of the length, and driven, as shown, with a wale of whole timber, to receive the lower ends of the diagonal and raking braces of the dam, which are to be tightened with wedges to the cleats on the backs of the main piles, and stiffened with three-inch planks, spiked on their sides, and also to the brace piles immediately below the tie, to steady the dam at top, and the whole is to be firmly secured with proper straps and inch bolts. The braces to the angles of the returns of the dams are to be of whole timber, as on the drawing, with an additional brace pile behind: strutting pieces are also to be inserted between the points of abuttal of the bracing on the main piles; and such other struts and bracing, as may be necessary in getting in the works, are also to be used.—The outer and inner rows of piling of the dam are to be securely tied together, with two-inch wrought-iron thorough bolts, passing at the heights shown from side to side of the dam, and through the guage piles, with proper washers thereto.—The fender piles are to be driven to the extent shown at each extremity of the dam, and at the distances marked therefrom, and from each other, and are to have floating beams or booms attached to them by chains passing round them, so as to allow the booms to move freely up and down with the flow and ebb of the tide.—All the piles are to be shod with proper wrought-iron shoes, to an approved pattern, those for the whole timber piles weighing 25lbs. each, and for the half timber ones 20lbs. each. The tops of the piles are to be hooped, and all such piling as is not truly and properly driven, and such as is, or is supposed to be split or otherwise injured in driving, is to be immediately taken up and replaced.—When the whole of the piles are driven and properly tied and braced, the space between the rows of close piling is to be cleared out to the clay, and then filled in solid up to the top with good stiff clay, mixed with a portion of gravel, and well worked and pounded in, so as to form a water-tight body, which, as it sinks, is to be made up, and afterwards occasionally rammed when required.—The foot of the piling, both outside and inside the dam, is also to be protected by a mass of proper material from the excavation, laid against it as shown; and where the dam meets the present wharfs at either end, the wall is to be cut through, and the puddle carried into the solid ground as far as may be necessary; the angles being also further protected by proper material laid outside and inside, with dwarf piling, to support the same if necessary.—Three trunks or shoots, consisting of two-feet cast-iron pipe, filled with proper water-tight valves, are to be provided and fixed with joints, also water-tight, in such situations and at such levels as may be judged necessary.

PUMPING.—For pumping and keeping the works clear of water, a low pressure steam-engine of not less than ten-horse power, with proper pumps, pumping apparatus, and other necessary machinery of approved construction, and of power sufficient for the purpose, is to be provided, and erected on a proper foundation or staging, on such part of the dam or ground as shall be pointed out, to be ready for work immediately on the completion of the dam. Proper drains to the engine well are also to be made, as shall be directed, and kept open, so that every part of the foundation may be kept clear of water while getting in.

EXCAVATION.—The excavation for the foundations is to be got out in lengths of 50 feet, and from the river wall to the front wall of the proposed building, including the sites of such walls, is to be carried to a depth of one foot under the lowermost course of footings of the walls, and of such width beyond them as to allow the foundations to be put in clear of the slopes, which, if necessary, to prevent their falling in, are to be supported at foot with piles and planking, or sheet piling, and these are to be removed as the backing of the wall is made up.—And when the excavation has been brought to the required depth, the surface is to be cleared and levelled to receive the concrete hereafter specified.—The whole of the materials, to the depth shown, is also to be removed to the extent showed in the drawing in No. 1, page 12, and carted or barged away, except such part thereof as may be approved as a fit ingredient in the mortar or concrete which may be retained for that purpose; and such portion of the present embankment wall as is included within the said tinted space, and also the waterman's stairs, are to be entirely taken down, and the rubbish cleared away; the materials, except such as may be required for purposes to be specified hereafter, becoming the property of the contractor.

FOUNDATIONS.—The sheet piling of the river wall is to be of the best fresh elm, eight inches thick, sawn all round, and to be shod with wrought-iron shoes, weighing 18lbs. each, and driven with a completely close joint in the most perfect manner, and each pile spiked to the wale, which is to be of sound English or African oak, in long lengths, lapped at the joints, and the whole is to be secured to the wall by means of inch wrought-iron ties, with cast-iron counter-sunk washer outside, passing through the wall, sunk into the stonework between the first and second course of footings, and terminating at an average length of six feet, with a nut screw and washer twelve inches long, six inches wide, and inch thick, let into the stone at a back vertical joint of one of such courses, and run with lead.—The concrete of the foundations of all the walls is to consist of six measures of gravel and sand to one of ground lime, mixed dry, and then well worked together with water, and in this state teemed and thrown into the work from a height of at least ten feet, and is to be brought to a level surface at the proper depth, to receive the first footing course, which is to bed solid upon it.

FOOTING COURSES.—The two footing courses of all, the walls are to be formed throughout of six-inch Yorkshire landings, of good tough quality, in large pieces, with fair beds, squared on the joints so as to lie close, and to be laid in mortar, with the joints properly broken as shown, the face being also bevelled next the sheet piling of the river wall, to suit the inclination of the same.—The two next courses of the river wall are to be faced with the best Bramley-fall, or other stone of equal and approved quality, in courses of the height marked, rough picked on face, and in other respects dressed and laid in the manner hereafter described for the ashlar generally, and of the same proportion of lengths and depths.

ASHLAR FACING.—The ashlar facing of the river wall, and of the return walls of the wings, is to be of blue Aberdeen, or blue Peterhead, or Hern or Dalkey, near Dublin, or the fine grained Dunleary granite, all of the best quality, in the uppermost six courses of the face generally, and in the spandrells of the stairs, as well as in all quoins throughout; and of the best Penryn, Heyton, Dartmoor, Fowey, or Galloway granite, in the rest of the work; and all the granite, of whichever of these descriptions, is to be without black spots, stains, or redness of any kind; and should any two or more of the said kinds be used together, it is to be perfectly understood, that uniformity of colour, and similarity of quality, are indispensable. The stones are to be fine axed on the face, to the true curve of the walls, so as to present a fair and perfect surface, at least equal to a sample which will be shown to intending contractors. The specimen stone will be shown by the porter at the door of the Speaker's house. The beds and joints are to be full and square for their whole depths (particular care being taken to preserve the outer arises), so that when set, the work may be close and solid throughout, without any packing, and no joint exceeding an eighth of an inch in thickness. The backs are to be scappled with a prick, square to the beds, and with a fair surface, to receive the brickwork.—The courses are to be of the heights figured, and to be laid with one header to every two stretchers. The heading stones are not to be less in length of face than the height of the courses of which they are to form part, nor less, in depth of top bed, than double the height of the said courses; the stretchers are not to be less, in length of face, than twice the height of the courses wherein they are to be inserted, nor less, in depth at top, than the height of the said courses, and the bond in the vertical joints is not to be in any case less than one-half of the height of the course immediately below them.—The stonework is to be laid throughout on a thick bed of mortar, proposed as hereafter directed, the front joints being pointed with cement, and then grouted full; and all the stones are to be worked on the ground, and set with lewises, and proper tackling.

BRICKWORK.—The back part of the river wall and returns, and the counterforts, the whole of the front wall of the building, including the octagonal turrets therein, and the returns of the wings and stair walls, and also the arch under the steps from the foundation upwards, and

other work shown on the drawings, are to be of brickwork, consisting of sound, hard, and well-burned square stocks, laid closely and well bonded, the joints being broken in a careful manner, and not exceeding a quarter of an inch in thickness, every course flushed up solid with thin mortar, and the filling-in bricks rubbed in so as to make each joint flush and full of mortar, and the whole is to be level at the top of every course of the facing ashlar. The arching for the support of the stairs is to be, as shown, springing from cut skew backs, and properly keyed in, the whole being flushed in solid after the arch is turned, and the bricks in the angles of the splayed work are to be neatly cut.

Backing and Filling-in.—The space between the river wall and the front wall of the building is to be brought up to the level of the top of the wall with concrete, composed of ten measures, of gravel and sand, to one of unslacked lime, washed in with water, and levelled in regular and thin courses as the work proceeds.—The remaining portion of the space shown on the general plan (in No. 1) and sections, the part under the stairs, and the hearting of the hollow octagonal turrets, are to be made up to the levels shown with concrete, same as has been described for the foundations of the walls, and used in like manner.—The space excavated in front of the river walls to get in the foundations thereof is to be made up to the level shown on the section, and cut to the brace piles of the dam, with pieces or burrs of the present embankment wall, laid at the foot of the proposed wall, and well grouted with concrete, same as the backing thereof.

Mortar and Concrete.—The mortar throughout is to be composed of one measure of the best fresh burned Merstram, Dorking, or other equal and approved lime, one measure of finely-ground genuine Italian pozzuoland, and two measures of sharp above-bridge river sand, all clean and free from rubbish, dirt, and other impurities. The proportions are to be correctly ascertained, after which the lime, which is to be brought from the kiln in small quantities as required, and kept dry under cover, is to be slaked and mixed with the pozzuoland and sand; they are then to be passed together in the dry state through screens, the water added, the mortar well tempered and worked to a tough and proper consistency, in horse or pug-mills for the work generally, but for the stonework, ground with edge stones, worked either by horses or by means of gear attached to the steam-engine for pumping the water out of the dam.—Fresh burned lime of the above description, and clean coarse river gravel, having mixed with it a proper quantity of sharp sand, are also to be used in the proportions stated in making the concrete that has been specified for the foundation of the walls and the backing.

REVIEWS.

Prolusiones Architectonicæ; or, Essays on Subjects connected with Grecian and Roman Architecture. By William Wilkins, A.M., R.A., F.R.S., Regius Professor of Architecture in the Royal Academy. 4to. Part 1. with 17 Plates. London, John Weale, 1837.

Although Mr. Gwilt has taken an opportunity in his "Elements" of sneering at the choice shown by the Royal Academy in electing Mr. Wilkins to the chair of architecture, as far as scholarship can be any qualification for that professorship, we know of no one in the profession who could have been opposed to him with equal pretensions. Even had he written nothing else, the present volume would fully make good his title to erudition, which, to say the truth, predominates in it to such a degree, that it will be quite a sealed book to the many, and must content itself with "audience fit, though few." Had its author wished for a motto to it, hardly could he have found a more appropriate one than the inscription over the entrance to the ante-room of the Academy's old apartments of Somerset House: Ουδεις Αμουσος Εισιτω. In the philology of the art it is *plus Arabe que l'Arabie même;* so much so, that it would have been more at home in the pages of the Classical Journal, than it can be in our columns; for the author seems to have written quite as much, if not more, for his brother scholars on the banks of Cam, than for his brother architects on those of Thames; especially in these degenerate days, when the folios of Stuart are stewed down, after portable soup fashion, and reduced to the tiny dimensions of a waistcoat pocket-volume. Still the volume is likely to be extensively purchased for the very reasons that will hinder it from being generally read.

Of the dissertations contained in it, we shall take the liberty of passing by those relative to the Erechtheum, the one on the Athenian inscription, with that upon the construction of roofs of temples; and confine ourselves to the last one, entitled "The Temple of Jerusalem, the Type of Grecian Architecture," as best suiting our purpose, and as likely to be most generally interesting. We may, however, remark *en passant*, that contrary to nearly all other writers, who call the tetrastyle portico of the triple temple on the Acropolis that of Minerva Polias, Mr. Wilkins gives that name to the hexastyle one at the East end, but, unless we have overlooked it, without assigning any reason for the change he has made.

We now proceed to consider the author's hypothesis on the subject of the Jewish, or as he terms it, Syrian temple; and hardly could he have selected one that admits of greater latitude of interpretation, or affords wider scope to fancy. It has accordingly been a favourite one with numerous writers who have exercised their ingenuity upon it, some of them till they have quite bewildered themselves and perplexed their readers. "Few things," observes Mr. Hosking, "have occasioned controversies more amusing, from the singularity of some assumptions, and the absolute futility of them all, than the style and manner in which Solomon's Temple was built." Thus the learned Spanish Jesuit Villalpanda insisted, among other things, that what we term the Corinthian order, had been employed in that edifice ages before the supposed invention of it. Mr. Wilkins now comes forward in his turn with a theory somewhat akin to that of the Spaniard, his object being to convince us that the Jewish edifice was the immediate prototype of the larger Doric temple at Pæstum, which agrees with it in all its admeasurements, as he shows by his plates of the two edifices. Still we cannot help thinking that he lays too much stress upon an agreement between them of that kind, which might be altogether accidental; while he treats as so unimportant as not to deserve notice, even those differences of plan which even his own drawings make manifest, and which, supposing him to be perfectly correct in all he assumes, must have produced a strongly marked difference of character. For instance, however exactly they might agree to size, there must surely have been considerable architectural disparity between an edifice enclosed on its sides and one end by a series of chambers, and having a porch in front *narrower* than the body of the building, and one that is peripteral, or entirely surrounded by columns. Were dissimilarity to stop short even here, there would be a sufficient degree of it to counterbalance that of the coincidence upon which, as it appears to us, Mr. Wilkins builds up the whole of his hypothesis; because as to the resemblance he is pleased to make out between the two structures, in the comparative elevation he gives of them, that is entirely conjectural, with nothing to corroborate it, should there be nothing positively to contradict it. So far, however, from this being the case, there is one circumstance overlooked by him, whether intentionally or not we pretend not to judge, that is fatally adverse to his argument and his elevations. In the First Book of Kings no mention is made of the height of the porch of the temple; but in the Second Book of Chronicles it is recorded to have been one hundred and twenty cubits, or six times its breadth; consequently it must have been a tower of lofty proportions, rising far above the rest of the edifice—a feature utterly irreconcilable with anything extant in Grecian architecture; while, as Stieglitz has observed, it reminds us at once of the tower-like *propyla*, erected before Egyptian temples. In front of such propyla it was usual to place obelisks, one on either side the entrance, and such we must suppose to have been the situation of the two mystic pillars Jachim and Boaz.

Now, how does Mr. Wilkins dispose of all this? Why, misled, at least so we cannot help thinking, both by his own ingenuity and his eagerness to establish his hypothesis, he cuts down this lofty part of the edifice into a mere distyle in antis porch, crowned by a pediment lower than that of the temple itself; which circumstance alone, of a double pediment, militates, we apprehend, not a little against that similarity between the Jewish and the Grecian temple, which it pleases him to take for granted. *Ce n'est que le premier pas qui coute*, therefore, after his taking such a stride towards his wished-for conclusion, we need not be at all surprised at his converting Jachim and Boaz into two ordinary Doric columns. This is perfectly a gratuitous assumption on his part, there being nothing whatever in the account we have of the building to show that they resembled those of the Doric or any other of the Grecian orders; on the contrary, as they were of "molten brass," the greater probability is that they were cylindrical, and that they were merely symbolic ornaments set up on each side of the entrance, and therefore obtained distinctive appellations, which we conceive they hardly would have in any other case. That they were so placed becomes all the more probable, because we read that the height of each was eighteen cubits, and that of its capital five, an exactness of information that might have been spared had they supported an entablature, since in that case their height must have necessarily been the same. Mr. Wilkins, indeed, contends, that our English translation is erroneous, and that by the term ἐπιθέματα, rendered "chapiters," should be understood the entablature; but then what occasion would there have been to remark that the dimensions were the same in regard to both columns, since difference would have been hardly possible; yet such difference alone would have required to be noticed. Whether Mr. Wilkins is at all borne out in his hypothesis by any one writer who has preceded him, is more than we can undertake to decide; but he certainly is quite at variance with all we have had the opportunity of referring to; among the rest John Wood, of Bath, who in his

"Origin of Building, or the Plagiarism of the Heathens Detected," treats at some length of Solomon's Temple. Most certainly Mr. Wilkins's hypothesis is not at all countenanced by Mr. Bardwell, who, in his chapter on Solomon's Temple, tells us that "it had not in proportions and details anything in common with the temples of Greece." In fact, although we have no means of judging from such partial, vague, and indefinite description as the Sacred Writings have handed down to us, how far the edifice resembled in details and style those of Egyptian architecture, there is enough to convince us, that in its interior ornaments and carvings it must have been utterly unlike anything we are acquainted with in Grecian architecture. The tall capitals assigned to the two columns of the porch warrant the supposition that they, and the columns themselves, partook largely of the Egyptian character; while, again, the extensive courts surrounding and enclosing the temple, and the loftiness of the porch, strikingly accord with the practice of the Egyptians. We leave it to those who have a taste for such fanciful speculations, to trace back the modern church tower or steeple to the porch of the Jewish temple, or the *propyla* of Egyptian ones.

How far it would be in Mr. Wilkins's power to continue and complete the parallel he has begun we know not, since he has not even touched upon this portion of it. After all, although we cannot bring ourselves to agree with his views of this particular subject, we readily bear our testimony to the value of his work, were it only on account of the light it throws upon much that is connected with the technical practice of the ancients, and the terms employed by them.

Le Keux's Memorials of Cambridge, &c., &c., with Historical and Descriptive Accounts of the Buildings. By Thomas Wright, M.A., *&c.* No. I.

The close similarity of plan between this work and the Memorials of Oxford renders it unnecessary for us to say anything in regard to the mode in which it is got up, or the execution of the views; for it may fairly be considered as another series of what will eventually form a single work, although either portion will be complete in itself. That the present series will be quite equal to the former one we make no doubt, and still more certain are we, that with a little attention it might be made to exhibit a decided improvement upon the "Oxford," without at all affecting uniformity of plan.

Instead, therefore, of flattering the parties engaged on the Memorials of "Cambridge," by assuring them they cannot do better than adhere in every respect to the system pursued in those of "Oxford," we prefer plainly telling them what we consider the defects of the latter; which we take this to be the more friendly mode of the two, because we shall be all in good time with our advice: it depends upon them to take it in good part, and avail themselves of it, though, after all, it is more likely that they will stick to their old course. Now, as concerns the illustrations of that university, it occasioned us no little dissatisfaction and disappointment to find that so large a proportion of the subjects are comparatively insignificant and devoid of interest, there being several views of churches which have not the slightest architectural value, and which can hardly be said to belong properly to the work. Had they been absolutely necessary in order to eke out another volume beyond the two to which the publication was originally limited, there might have been some excuse for resorting to them as a *pis aller*. So far, however, from this being the case, while they have been thus dragged in for the nonce, many very interesting parts, both of the colleges themselves, and of other public buildings, are not shown at all. With regard to their interiors matters stand even worse, since of such subjects there is but a very small sprinkling indeed, and that consists not so much of collegiate edifices as of churches. In fact, so very far is that or any other work of the kind we have yet met with from having gleaned the field quite bare, that an artist of any intelligence and taste would discover for his pencil as many, or even a greater number of perfectly fresh and untouched subjects than of those already handled. We are further of opinion that it would have been an essentially serviceable feature in the work, had there been a general ichnography or block plan of each college, showing the disposition of its buildings, courts, &c., which would have afforded a far clearer idea of its extent and locality than can be conveyed by a page of description. Such plans might have been given without incurring additional expense for woodcuts, because many of the present ones—those of seals and similar 'curiosities'—could very well have been spared in order to make room for what would have been so much more instructive.

As we have stated, we have not the slightest expectation that our advice will be taken, otherwise than in dudgeon. Nevertheless, although foreseeing that such is likely to be the event, we cannot help tacking to it another piece of admonition, which is, that fresher points of view should be selected than we perceive has been for the "Library" and "Great Court" of Trinity College, in the first number of the "Cambridge." For want of due attention to this, drawings "made expressly for the work" are apt to look too much like copies from other publications. Topographical collectors—and we presume the work looks to that class of purchasers for some patronage—feel the consequences of this very sensibly, for they get precisely the same subjects over and over again; the only difference between old acquaintances and the new-comers being that the latter may be better-looking. Let this be reformed. It would not, indeed, in every instance, be so easy to select a new point of view quite so good as those already made use of; but there are also many cases where it would not be difficult to make choice of one far better. Besides, even where there is hardly any alternative than taking a view of a building in the same *direction* as has been repeatedly done before, there is no necessity to take it likewise from the same *distance*, and make the subject the same composition. It would frequently be very much better to bring the building nearer than is usually done, so as to describe its architectural character more exactly, and to dwell upon the expression of its details more *con amore*. One other piece of advice and we have done for the present, though, as we shall keep our eye upon the work during its progress, we shall perhaps occasionally make our report to our readers. What we lastly recommend is, that as the letter-press is evidently got up to accompany the plates, and not *vice versa*, there should be much more of architectural description than we meet with in the "Oxford," which is in that respect exceedingly jejune and unsatisfactory.

Notes Abroad, and Rhapsodies at Home. By a Veteran Traveller. 2 Vols. London, 1837.

Most undoubtedly, this work is not exactly one of those which we profess to take cognizance of; still it contains so much upon the subject of architecture, that we are fully warranted in so far considering it as belonging to our jurisdiction. On the other hand, we hardly need regret that we are relieved from the duty of passing any formal opinion on the rest of its contents; because, to say the truth, there is a good deal in it likely to give offence to the thin-skinned, which may be one reason why the reviewers seem so very shy of touching it. All, therefore, that we shall say in regard to these two volumes generally is, that our "Veteran" seems to be of the same family as the "Old Traveller," whose "Vagaries" are in the course of being served up in "Fraser's Magazine." Both are furiously anti-Catholic,—the "Old Traveller," even more so, if possible, than the "Veteran" one. Both run quite counter to the ready-made cant of Guide-books, and Ciceroni; and both speak out their minds with a freedom that is absolutely startling. If the one execrates St. Peter's with an energy that leads us to suspect he is not quite so "Old" as he pretends, the other execrates Palladio hardly less vigorously.

As a slight specimen of the former, we quote his opinion of St. Peter's: "*As a kaleidoscope for children*, it is worth preserving; as a temple of God, it is a profanation, a mockery, an absurdity, and rebuke. It may fulfil the purposes of a superstition bent on imposition, and only to be maintained by fraud and deceit. It may dazzle the miserable slave crouching to its marble gods, and enforce a kind of veneration for the working of its priests; but as a specimen of art, and an emblem of mortal power, it presents the most lamentable failure in the history of mankind." This is pretty well; there are, however, two other touches which we cannot help quoting, and which we would recommend to the consideration of the "Dublin Review." "A few barrels of gunpowder, judiciously lighted under St. Peter's, would send to heaven all of the Pope that is likely ever to get there." And perhaps our readers will think so when informed that "the morals of the hierarchy may be best exemplified by simply stating, that his present *Holiness* finds, in the passable person of a barber's wife, a *chère amie* to console the dulness of celibacy"!!!—so much for Gregory XVI., the present successor of St. Peter, and Vicegerent of Christ.

That writer certainly does not mince the matter; neither does the "Veteran," except indeed it be by making mince-meat of some of those upon whom he pounces. And of this latter, the language is frequently *tranchant*; his irony keen, his satire bitter, though at times playful and humorous withal, with here and there some flashes of genuine wit. We have heard his work abused as grossly personal; and, indeed, he does make exceedingly free with a great many names, but then they are of such people alone as have courted notoriety, nor does he drag them before the public an inch further than they had previously thrust themselves, although in a somewhat different plight. Probably, therefore, those who are most angry, are irritated not at the injustice of what he says, but because it is so just that it comes doubly home to them and sticks by them.

However, our proem is growing rather too lengthy, at least for our columns; let us, therefore, set before our readers at once an extract from what he says of Palladio; and we select his remarks on the Villa Capra, near Vicenza, that being an edifice with which most of them must be familiar, if only from engravings.

"The celebrated Villa Capra, situated about a mile from Vicenza, and misnamed the Rotunda,—it having nothing of the rotund about it, except in the odd shaped dome rising from its centre,—enjoys a reputation for which it is difficult to account, otherwise than by attributing its continuance to that superstition and indolence on the part of criticism, which induce uninquiring acquiescence in opinions no one would now venture to bring forward for the first time. Of regularity there is no want, the four fronts being perfectly alike, except as to some slight details, and each having an advanced hexastyle Ionic portico, with a lofty flight of steps leading up to it; yet regularity here seems carried to excess, for not only does it occasion a rather monotonous repetition, where propriety would have admitted of some variation of design, but it occasions the house to look as if nearly all entrance, and, in fact, renders it much smaller as a residence than at first sight it promises. No space is left for rooms except at the angles, the internal plan being cut up by the four passages leading from the porticos to the central hall or *salone*. This last-mentioned, again, by no means answers to our English ideas of a saloon, since, instead of being the principal apartment, it is a mere vestibule, and one, moreover, that is necessarily a common thoroughfare; added to which, its space and loftiness causes the other rooms to appear small and insignificant; neither does it make that display of beauty which would reconcile us to so much of the internal space being thus applied; for with the exception of the doors, it is almost naked, unless we can fancy the ugly projecting balustrade, forming a gallery on the level of the upper floor, to be any decoration. This want of embellishment does not render itself particularly perceptible, thanks to the extreme scantiness of light admitted through the small lantern on the summit of the dome, which is no more than sufficient to give the place the air of a dismal cavern. For so much space being lost in detached passages, and for the mode in which the rooms are insulated, some allowance is, perhaps, to be made, tradition informing us that the house was originally a *picnic* residence built for four brothers, each of whom had his particular *sala* and adjoining ante-room, while the *salone* was in common for them all and their attendants: why they could not have made as good shift with a single portico as with a single vestibule it is difficult to conjecture. However, the architect does not seem to have put his ingenuity at all to the stretch, because, although he has been liberal enough to assign a separate portico to each of the four co-proprietors, every one of the porticos affords access to two distinct apartments, so that instead of having one exclusively to himself and his particular visitors, each may be said to have been the owner of only the halves of two separate porticos. This remark certainly partakes largely of trifling hypercriticism; yet, where so much stress is laid upon the ingenuity displayed by the architect, we are warranted in looking for some particular evidence of it; nor, in excuse for the absence of it, can it be urged that he has manifested any happiness of invention or novel effect.

"The exterior is not much more commendable for its design than the interior for its accommodation, for when a person is told that there are four porticos he has nearly all its merits and pretensions summed up in that piece of intelligence; and should he not care to have his imagination considerably chilled, he will do well to draw upon his own fancy, without examining or inquiring into particulars. It is true the porticos project considerably from the building, and so far contribute to variety, both of shadow and of outline; at the same time, owing to their ends being closed up, with the exception of an open arch, there is a heaviness of appearance in them, and much of the character of such a feature is lost. As to the order, it is merely by courtesy styled Ionic, it bearing just that kind of resemblance to what its name denotes it as to render us all the more sensible of its deformity; whereas, were it something altogether different, we could not compare it [judge of it] by such a standard. The resemblance it bears to the Grecian Ionic generally, or to any of its varieties, is precisely that which an emaciated, cadaverous body, bears to one full of vigour and health. The shafts of the columns are both lanky and gouty; and the capitals have a truly consumptive look, and are without volume, or flow in their volutes, which are indeed so truly insignificant, when compared with those of the Grecian Ionic, that they almost cease to be indicial features of the order. Now, although Roman architecture offers hardly a single tolerable example of that order, except it be in detached columns and capitals applied to other buildings, surely a man who possessed any genius or taste must have been sensible of the imperfection of his models, and ought to have detected in what they were deficient, and endeavoured to produce something better, which he might have done without having seen any of the Grecian prototypes of the deteriorated Ionic of Rome and Italy. Such new productions might have been more unlike the originals than even the spurious Roman specimens are, and yet far superior to the latter."

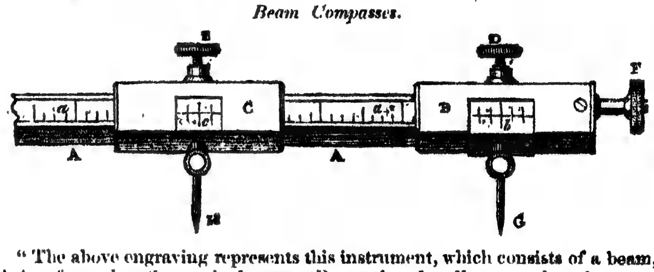
Herein we cordially agree with the writer, and consider it matter of regret that the *revivalists*, as they are termed, should almost at the very outset have imposed upon themselves and their followers such arbitrary and cramping rules as to columns and entablatures, which admit of equal, if not greater variety in their ornamental details than any other features, while they tolerated and even set the example of the utmost licentiousness, and of contrariety to classic feeling in almost every thing else. Notwithstanding the length of our extract, it does not contain the whole of the writer's remarks on that single edifice of Palladio's; hence it will be perceived that he is not one of those who give their opinion of a building in a brief sentence, or dispatch it with some epithet of unqualified admiration or reprehension. With equal minuteness does he discuss the merits of the *Teatro Olimpico*, which others have—it must be confessed rather childishly—extolled as a prodigy, both of conception and taste. "What," very reasonably asks our author, "can be more contrary to common sense than to dispose the seats in concentric curves, so that the greater part of the audience can see the performance only sideways, instead of placing them all in front, by making the rows of seats parallel to the stage?" He afterwards goes on to observe, that the stage or *scena*, and "the *practicable* alleys opening into it, are the most toyish, baby-house affair imaginable, and are so far from being calculated to enhance perspective illusion, as to be in utter contradiction to it," because "the actors must appear of the Brobdignagian size as they advance up those alleys. In fact, the centre one," he adds "becomes so narrow at its further extremity, that I question whether the starved apothecary in 'Romeo and Juliet' would not be fairly wedged in between the houses."

Among the other pieces of architectural criticism, that on Milan Cathedral is the longest, and comprises a very ingenious and plausible, if not entirely successful, defence of the intermixture of styles in the façade of that edifice. But for this we must refer our readers to the work itself, unless the specimens we have laid before them are so unsatisfactory, and the character we have given of it so unprepossessing, that they have no desire to become better acquainted with it. For our own part, we shall be most happy to meet with him again, and to listen to him whether discoursing on architecture, or exposing follies and knaveries, with more of piquancy and caustic pleasantry than of indulgent forbearance.

A Treatise on the Principal Mathematical Drawing Instruments employed by the Engineer, Architect, and Surveyor. By F. W. Simms, C. E. *With numerous wood-cuts.* London: John Weale, 1837.

This is a very useful little work for the pupil on entering the profession; it gives him an insight into the different instruments that are required in the office, and how they are to be applied. We make the following selection as an example of the work.

Beam Compasses.



"The above engraving represents this instrument, which consists of a beam, A A, of any length required, generally made of well-seasoned mahogany; upon its face is inlaid throughout its whole length a slip of holly or box-wood, *a a*, upon which are engraved the divisions or scale, either feet and decimals, or inches and decimals, or whatever particular scale may be required; those made for the use of the persons engaged on the Ordnance Survey of Ireland, were divided to a scale of chains, 80 of which being equal to six inches; which, therefore, represented one mile, that being the scale to which that important survey is being plotted. Two brass boxes, B and C, are adapted to the beam; the latter may be moved, by sliding, to any part of its length, and fixed in position by tightening the clamp-screw E. Connected with the brass boxes are the two points of the instrument, G and H, which may have any extent of opening by sliding the box C along the beam, the other box B being firmly fixed at one extremity. The object to be attained, in the use of this instrument, is the nice adjustment of the points G H to any definite distance apart; this is accomplished by two vernier or reading plates *b c*, each fixed at the side of an opening in the brass boxes to which they are attached, and afford the means of minutely subdividing the principal divisions *a a* on the beam, which appear through those openings. D is a clamp-screw for a similar purpose as the screw E, namely, to fix the box B, and prevent motion in the point it carries after adjustment to position. F is a slow motion screw, by which the point G may be moved any very minute quantity for perfecting the setting of the instrument, after it has been otherwise set as nearly as possible by the hand alone."

Railway Practice, with Plates. By S. E. Brees, C.E., &c. London: John Williams, 1837.

The value of such books as the one now before us cannot be too highly appreciated, particularly when they contain copies of the working drawings and specifications of Railways that are in progress, and being executed, under the directions of the most eminent engineers. The profession, and we may say also the public in general, cannot but admire the liberal feeling of those gentlemen who have so nobly lent their drawings for the purpose of publication; such a feeling we are sure will tend to raise their name, if possible, in the estimation of their professional brethren, and we trust that this degree of liberality will be supported by others with the same spirit, and not let it be said, as we have too often heard, and are sorry to say too true, that Englishmen are fond of letting foreigners have copies of their drawings which they refused to their own countrymen; but we do hope the bright example now before us will

reverse this order of things. We must here remark in good feeling, that the liberality of the contributors have not been met with the same degree of spirit by the publisher; we consider that more pains should have been taken, and the work better got up, and the plates engraved: no doubt we shall be answered that the work would not pay, and that the profession is not sufficiently numerous for an extensive sale, to repay the cost of such a publication; however, it is not our wish to depreciate the work, further than to say, that it cannot be considered as a work of art, but it must be strictly understood as a sound practical work, valuable not only to the student, but to every member of the profession. It is not now our intention to enter *seriatim* into a review of the several works contained in the book, but shall reserve our remarks to a future opportunity, when we shall enter into a minute review of the several designs; some of them we shall examine into critically, and state our opinion on the soundness of their construction, and the taste displayed;—we will for the present proceed to give a brief outline of the work, that the profession may be able to judge of its character and utility. It contains

40 plates and specifications of bridges, tunnels, turn-rails and retaining walls, on the London and Birmingham Railway; R. Stephenson, Esq., Engineer. The 14 first plates are details of the works on the extension line to Euston Square.

3 plates of bridges on the Great Western Railway; J. K. Brunel, Esq., Engineer.

3 plates of the skew bridge, over the Spa Road, on the Greenwich Railway; George Landman, Esq., Engineer.

2 plates and specifications of the viaduct over the valley of the Avon, and bridge over the River Trent, on the Midland Counties Railway; C. Vignoles, Esq., Engineer, and J. Woodhouse, Esq., Resident Engineer.

1 plate of the viaduct over the River Ribble, on the North Union Railway; C. Vignoles, Esq., Engineer.

7 plates of the sheds, turn-tables and cranes at the depôt on the Leeds and Selby Railway; J. Walker, Esq., Engineer, and George Smith, Esq., Resident Engineer.

5 plates of bridges on the Grand Junction Railway; Joseph Locke, Esq., Engineer.

2 plates and specifications of the cuttings and occupation bridge on the Slamannan Railway; John Macneil, Esq., Engineer.

2 plates of the aqueduct over the River Lune; Sir John Rennie, Engineer.

And 12 plates containing designs of viaducts, bridges, and tunnel fronts, by the Editor; all of which had better have been omitted, and the book confined entirely to works either executed or in progress.

We should advise that the plates be kept distinct from the letter-press, as, by folding and binding them in a Volume, they are not so convenient for reference.

The plates of a few copies of the work have been coloured, which better distinguishes the character of the construction.

A Practical Essay on the Construction and Management of Steam Engine Boilers, as now used in the Manufacturing Districts around Manchester No. 1. By R. Armstrong, C.E.

This work, professedly produced for the use of practical men, is written in a clear and intelligible style, which greatly enhances its value as a work of reference. Nothing very novel is elicited in the course of the first part of the second chapter, which has appeared; but the rules and data, based upon an extensive series of observations and experiments, are valuable, inasmuch as they are simple and of easy application, a recommendation of no mean value with the real mechanic, whose forte lies rather in mechanical combination, than in arithmetical analyses.

The mode by which the author conducted his preliminary experiments is well explained:—

"3. Amongst my earlier experiments, which were made on a smaller scale, was one with a common furnace, pot, or boiler, of cast iron, such as are usually set in kitchens; it was capable of holding eighteen to twenty gallons; the fire grate was six inches by eight, or one-third of a square foot in area, and the whole of the heating surface exposed was about three square feet. Into this boiler was measured two cubic feet of water, and after having caused it to boil, I then found, that by feeding the furnace with coal and the boiler with water, and at the same time managing the draught of the chimney so as to keep the water boiling nearly at a uniform rate, the consumption of good coal was at the rate of four and a half pounds per hour, and the quantity of water boiled away in that time was exactly two gallons, or very nearly one-third of a cubic foot.

"4. Now, as it is usual to reckon that the evaporation of one cubic foot of water per hour is sufficient to furnish steam for one horse power, we have only to multiply each of the foregoing results by three to obtain the following proportions:—

1 cubic foot of water evaporated per hour, requires
1 square yard, or 9 square feet, of heating surface,
1 square foot of fire-grate, and
[illegible] of good coal

We thus obtain what may be called a rough estimate of a boiler of one horse power, and with an expenditure of fuel approaching to the usual allowance of fourteen pounds of coal per horse per hour. This experiment, which was frequently repeated, was made with an open-topped boiler, which induced me to make several other experiments with a variety of small boilers, more nearly assimilated to the condition of an ordinary steam boiler attached to an engine at work; the results were, in all cases, whether under a pressure of four or five pounds per square inch, or open to the pressure of the atmosphere alone, so nearly agreeing with the above, that excepting increasing the quantity of water in the boiler, which seemed to increase the quantity of fuel used in getting up the steam, but at the same time lessened the other portion of the general consumption, by lessening the difficulty of regulating the fire, there was no other alteration that materially affected the results as given above."

The observations on the subject of burning smoke deserves attention.

"37. However, in the course of those experiments we always found that nothing tended so much to the accomplishment of both these objects as enlarging the furnace and flame bed, and where the draught of the chimney was good, also enlarging the fire grate. In adopting this last alteration, it was always found, that the maximum effect was produced when the area of the fire-grate was increased in a somewhat greater ratio than the effective heating surface was diminished;—that is, when a certain effect is to be produced, say for example, an evaporating power equal to the supply of a twenty-horse engine, which we have seen requires twenty square yards of effective heating surface, but from malconstruction of the boiler or other circumstances we have only eighteen yards, then the furnace will require to have a fire grate of *little more* than twenty-two square feet in area; or, if the heating surface be only sixteen yards, then the fire-grate will be required to be *more than twenty-four*, in fact about 25 square feet."

The formulæ and rules for finding the horse power, area of the fire-grates, and area of effective heating surface, will be found useful; but for information on this point, we refer the reader to the work itself, as the rules, with the examples, are too voluminous for extract into our pages.

We think the author has overlooked one of the greatest causes of priming, particularly in locomotives, viz., the foulness of the boiler; it is a fact well-known to all persons conversant with locomotives, that the engine primes in proportion as the water is dirty, and the remedy is to empty the boiler and clean it out, and when clean, the same boiler, under the same conditions of the valves, &c., will not prime at all; thus, it occurs to us, that the explanations given in the work are not satisfactory.

We recommend this work, notwithstanding, to every man connected with steam, whether he be a maker of boilers, or user of them.

The Churches of London. By George Goodwin, Jun., Architect, Associate of the Institute of British Architects; assisted by John Britton, Esq., F.S.A. London: C. Tilt, 1837.

This very useful and justly popular work has arrived at its eleventh number: each number contains two engravings of an interior and exterior view of one of our Metropolitan Churches, with critical notices, interspersed with well-executed wood engravings. The object of the author is to render typographical matter, by the aid of criticism, occasional reflections, disputations, and otherwise, interesting to the general reader, and which will ultimately draw his attention to the study of Church architecture. The author is entitled to the warmest encomium of the profession for his efforts in the endeavour to inculcate into the minds of the public a taste for this important branch of architecture. The work is intended to give accounts and illustrations of all the churches that are strictly within the limits of the city of London, and it is calculated not to exceed, when completed, 36 numbers which, when bound up in a volume, will not cost more than 2*l*. We shall notice the future numbers as they are published.

A Popular Treatise on the Warming and Ventilation of Buildings. By Charles John Richardson, Architect. *Illustrated with 18 Zinc Plates.* London: John Weale, 1837.

The system of warming buildings has often been written on by various authors, each advocating their own peculiar hobbies, and depreciating those systems which do not exactly suit their fancies, without attempting to enter into the subject philosophically or experimentally, but confine themselves to mere assertions. The work before us, we anticipated, was somewhat of a different cast; but we must say, that on perusing it we were much disappointed, and instead of it being a treatise on the warming of buildings generally, it is a treatise on warming buildings on Mr. Perkins' principle, so far as describing Mr. Perkins' apparatus; and showing how it may be applied to buildings of various descriptions, the author has done full justice to the inventor, not only in detailing the system, but also in his illustrations, which are particularly good. The work contains several plans and sections of public buildings, as the British Museum, Atlas Insurance Office, Strathfieldsaye House, Soane Museum, House of Commons, Registry Office, and New Justiciary Courts at Edinburgh, and several other buildings; showing how conveniently Mr. Perkins' system has been applied in

warming all these buildings by the circulation of warm water at high pressures through pipes of small dimensions (one inch tubes). The author thus describes the apparatus :

"The superiority of Mr. Perkins's apparatus, consists in his having availed himself to the utmost of the great advantages presented by water as a circulating medium for transmitting heat, and which, until his system appeared, had only been, as before seen, very insufficiently and imperfectly applied.

"The quantity of water necessary is reduced to a mere fractional part only of what has been before used. The apparatus is rendered smaller, the diameter of the tube is reduced from four inches to one inch only; and this is done with a proportionate degree of effect. The small quantity of water in immediate contact with the fire, receives the heat more rapidly; hence, a free and rapid circulation is caused.

"In its simplest form, the apparatus consists of a continuous or endless tube, closed in all parts and filled with water; about *one-sixth part* of which tube being coiled in any suitable form, is placed in the furnace, and the other five-sixths are heated by the circulation of the hot water which flows from the top of this coil, and cooling in its progress through the building, returns into the bottom of the coil to be re-heated.

"The procuring a circulation of water through such small tubes, is obtained by the extreme expansibility of water, which is much greater than any other fluid. We have only to consider the relative specific gravities which two columns of water must bear to each other, one column having been rendered lighter by the application of heat, which expands it, and fills it with minute bubbles of steam which rise rapidly to the upper part of the tube, and becoming there condensed into water again, and then forming another column of water, which, from having no bubbles of steam in it, must necessarily descend in proportion to the expansion of water in the ascending column. Knowing steam to be 1800 times lighter than water, it may easily be conceived how readily a small stream of water may be kept in constant circulating motion; and, when combined with its power of absorbing heat, it is not surprising that it should extend through a considerable length of pipe before it cools so as to be inefficient.

"A tube, called an expansion-tube, is placed above the highest level of the small tubes led through the various apartments of the building. The filling-tube of the apparatus is placed on a level with the bottom of this tube, so as to perfectly fill all the small tubes, and yet prevent the possibility of filling the expansion tube itself. This tube is generally of larger diameter than those which are used as heating surfaces, and its length is proportioned to the quantity of tube to which it is attached, and being thus left empty, allows the water, as it becomes heated, to expand without endangering the bursting of the smaller tubes.

"Water, when heated from forty degrees to two hundred and twelve degrees, expands about five per cent., and Mr. Perkins, senior, has proved, by means of his powerful compressing machine, that it requires 28,000lbs. to the square inch to compress water five per cent.; hence the necessity of allowing sufficient expansion for the water.

"Practice has proved, that fifteen to twenty per cent. of expansion space is ample for the greatest heat which can be attained by hot water.

"The natural tendency to ascend of the column of heated water, is aided as much as possible by so placing the furnace in the building, that the tube proceeding from the top of the coil can be carried straight up at once to the highest level where the water has to circulate, and where the expansion-tube is placed; from this point two or more descending columns can be formed, it being only necessary to connect them in one tube before entering the furnace.

"The heat is communicated to the atmosphere of the building from the external surface of the tubes, which are either coiled up and placed in pedestals, ranged round the room behind skirting boards, with open trellis work in front,—sunk in stone floors, or placed in any manner most convenient. * *

"The temperature of Mr. Perkins's tubes can be made to vary from 150 degrees to 300 degrees, in rooms where great heat is desired, such as drying-houses, &c., a temperature from 300 degrees to 400 degrees can easily be obtained."

Mr. Richardson has omitted to show the quantity of fuel consumed for heating a given length of pipe, or space of building, so very important to support the system he advocates. Throughout the work there is only one passage that in any way alludes to it: after giving a description of the plan adopted for warming Mr. Cadell's establishment at Edinburgh, which is done by a circulation of hot water through about 1000 feet of tubing, the author states, that

"The whole daily consumption of fuel in Mr. Cadell's establishment is three quarters of a cwt., of which one-third is coal and two-thirds coke, from the gas-works; this quantity lasts till night."

In the second part of the work, which treats on ventilation, the author has given several useful hints, and shows how easily a good system of ventilation might be obtained.

"In the ventilation and warming of a private dwelling, I would begin first with the staircase. This we ought to consider the principal artery of the house; and if this was well warmed by a current of warm fresh air flowing into it, and a constant change effected by a ventilating outlet warmed so as to ensure its effective operation, great part of the business would be effected, as the staircase would supply all rooms not in use with warm air in a sufficient degree, and would gradually ventilate the whole building, rendering it unnecessary to have further ventilation, except in the principal living and sleeping rooms of the family.

"Where the latter was desired, by placing two or more spare columns of tubing in flues concealed within the thickness of the wall, two flues, or even one flue, properly constructed for the purpose, might be made to ventilate every room of a London house."

In an Appendix to the work a brief description is given of warming and ventilating by gas, Mr. F. A. Beinhardt's system by heated air, Dr. Arnot's air stove, and the various plans that have been introduced at different times for warming and ventilating the Houses of Parliament.

A Practical Treatise on Warming Buildings by Hot Water. By Charles Hood, F.R.A.S. *Illustrated by numerous Wood-cuts.* London: Whittaker and Co., 1837.

We have not space or time to review this work minutely, and must defer our remarks for the next Number; we perceive that it fully confirms our prefatory remarks in the preceding review, what one author approves another condemns. In the work before us, the Author's remarks on Mr. Perkins's principle of Warming Buildings, or "the high pressure hot-water apparatus," are at variance with Mr. Richardson's description and notions.

A Treatise on the Strength of Timber, Cast Iron, Malleable Iron, and other Materials. By Peter Barlow, *F.R.S., &c.* London: John Weale.

[SECOND NOTICE.]

In our last Number we noticed this Book, and made several extracts, to show the value of the work;—and to render our extracts more complete, and to show that the author has considered the strength of Timber as applied in every variety of cases, and also to show the value of his rules, we give the following additional extracts *on the elasticity of Timber.*

"Problem IV.—*To determine the Dimensions of a Beam, capable of supporting a given Weight with a given degree of Deflection, when fixed at one end.*

"*Rule.*—Divide the weight in lbs. by the reduced tabular value of E,* multiplied by the breadth and deflection, both in inches; then the cube root of the quotient multiplied by the length in feet, will be the depth required in inches. †

"*Example* I.—A beam of Riga fir is intended to bear a load of 665 lbs. at its extremity, its length being 5 feet, its breadth 4 inches, and the deflection not to exceed $\frac{1}{4}$ of an inch.

"In this case the tabular value of E is 96; hence, $\frac{665}{96 \times 4 \times \frac{1}{4}} = 6{\cdot}88$; the cube root of which is 1·902; hence, $5 \times 1{\cdot}902 = 9{\cdot}51$ inches, the depth required.

"By reference to Example I. of Prob. II. it will be found, that a beam of 6 inches depth would be sufficient to bear the load; but when, from the nature of the construction, only a limited degree of flexure can be allowed, this mode of calculation becomes necessary.

"*Note* 1.—When the weight is uniformly distributed over the length of the beam, the deflection will be only $\frac{3}{8}$ths of the deflection from the same weight applied at the extremity, and in the rule consider the weight reduced in this proportion.

"*Note* 2.—If the beam be a cylinder, the deflection will be 1·7 times the deflection of a square beam, other circumstances being the same.

"*Note* 3.—In the above examples the reduction of results to the differences depending on the specific gravity is not shown, neither is it applicable in practice; but for theoretical comparison it is important, and may always be performed by stating, as the specific gravity of the tabular specimen is to the load supported in any example, so is the actual specific gravity of the specimen it would support under similar circumstances.

"Problem V.—*To find the Dimensions of a Beam, capable of sustaining a given Weight with a given degree of Deflection, when supported at both ends.*

"*Rule.*—Multiply the weight to be supported in lbs. by the cube of the length in feet. Divide this product by 32 times the reduced tabular value of E (see Note 1, Prob. IV.), multiplied into the given deflection in inches, and the quotient is the breadth multiplied by the cube of the depth in inches.

"*Note* 1.—If the beam be intended to be square, then the breadth is equal to the depth, and the fourth root of the quotient is the depth required.

"*Note* 2.—If the beam be a cylinder, multiply the quotient by 1·7, and then the fourth root will be the diameter of the cylinder.

"*Note* 3.—When the load producing the depression is greater than one-fourth of the greatest stress the beam would bear, it is too great to be trusted in construction; but in timber this limit is seldom exceeded on account of its flexibility.

* "The value of E in these rules is the tabular value divided by 1728, which renders it unnecessary to reduce the length in feet into inches.

For English Oak, E = 105
For Riga Fir, E = 96

† "This rule is applicable to the imperfect fixing which obtains in practice; but the more perfect the mode of fixing is, the nearer the deflection will be to half that determined by the rule, and ordinary cases will usually be a mean between these results."

"*Note* 4.—If the load be uniformly distributed over the length, the deflection will be $\frac{5}{8}$ths of the deflection from the same load collected in the middle. And in the rule, employ $\frac{5}{8}$ths of the weight of the load instead of the whole load.

"*Example* I.—The length of the fir shaft of a water-wheel being 20 feet, and the stress upon it 7 tons, it is required to determine its diameter so that its deflection may not exceed ·2 of an inch.

"The reduced tabular value of E=96, or more exactly 32 E = 3075, and 7 tons=15680 lbs.; hence (by the Rule and Note 2)

$\frac{1·7 \times 15680 \times 20^3}{3075 \times ·2} = 346730$ nearly. The fourth root of this sum is 24·3 inches, the diameter required.

"Shafts which are to be cut for inserting arms, &c., will require to be larger, in a degree equivalent to the quantity destroyed by cutting.

"The flexure of shafts ought not to exceed $\frac{1}{100}$ of an inch for each foot in length, this being considered the limit; and it will be always desirable to make shafts as short as possible, to avoid bending.

"*Example* II.—The greatest variable load on a floor being 120 lbs. per superficial foot, it is required to determine the depth of a square girder to support it, the area of the floor sustained by the girder being 160 feet, the length of the girder 20 feet, and the deflection not to exceed half an inch.

"The reduced value of E for Riga fir is 96 or 32 E = 3075, and the weight is 120 × 160 = 19200 lbs. uniformly distributed; hence (by Note 4) we have $\frac{\frac{5}{8} \times 19200 \times 20^3}{3075 \times \frac{1}{2}} = 62440$. The fourth root of this number is 15·8 inches, the depth required.

"The deflection of $\frac{1}{40}$th of an inch for each foot in length is not injurious to ceilings; indeed, the usual allowance for settlement is about twice that quantity. Ceilings have been found to settle about four times as much without causing cracks, and have been raised back again without injury.

"The variable load on a floor seldom can exceed half the quantity of 120 lbs. on a superficial foot, unless it be in public rooms; hence, the number may be taken from 60 to 120, according to circumstances.

"The same rule applies to joists of different kinds for floors; the area of the floor supported by the joists being multiplied by from 60 to 120 lbs. per superficial foot, according to the use the room is designed for.

"*Example* III.—To determine the size of a rafter for a roof to support the covering of slate, the distance between the supports being 6 feet, and the weight of a superficial foot, including the stress of the wind, being 56 lbs., and the deflection not to exceed $\frac{1}{40}$th of an inch for each foot in length.

"The tabular value gives

32 E = 3075, the weight = 56 × 6 = 336 lbs.; hence (by Note 4)

$$\frac{5 \times 336 \times 40 \times 6^3}{8 \times 3075 \times 6} = 98·34.$$

"If the breadth be made 2½ inches, then

$$\frac{98·34}{2·5} = 39·3;$$

and the cube root of 39·3 is 3·4 inches, the depth required.

"*Minutes of Proceedings of the Institution of Civil Engineers, containing Abstracts of Papers, and of Conversation for the Sessions of* 1837."

(Continued from Page 26.)

"February 14, 1837.—The President in the Chair.

"'*Description of Mr. Henry Guy's method of giving a true spherical figure to balls of Metal, Glass, Agate, or other hard substances.' Communicated by Bryan Donkin, Esq., V.P. Inst. C.E.*

"The method adopted by Mr. Guy consists simply in applying to practice the principle, that if a ball can be made to revolve rapidly in every possible direction, or, in other words, if during such revolution its axis of rotation be constantly changing its angular position within the ball itself, whilst a grinding tool is applied to the surface of the ball, the most prominent parts of that surface will be first acted on by the grinder, and by continuing the operation the whole of the higher parts of the surface will be progressively ground off, and the ball will ultimately be left of a perfect spherical shape. Mr. Guy effects this, by placing the ball betwixt the faces of two wooden chucks fixed to two lathe mandrils, such as are used in common turning lathes, with their axes exactly in a line with each other. A quick motion is given to the mandrils in the usual way by two bands, so applied that the mandrils are placed in opposite directions; the ball being compressed betwixt the chucks turns, notwithstanding the friction of the tool. The tool is a bar of brass or iron, with a conical hole near one end, the larger diameter of which is made a little larger than the diameter of the ball.

"'*On the Construction of Railways of continuous Bearing; by John Reynolds, A. Inst. C.E.'*

"The author states the conditions essential for a good railway to be as follows. 1. That it should be the closest practical approximation to a perfect plane of perfect stability. 2. That it should be adapted to prevent or to neutralize the vibrations from the impact of imperfect cylinders rolling on imperfect planes. 3. That it should possess the greatest durability and the greatest facility of being repaired, which are compatible with the above conditions. Mr. Reynolds proposes trough-shaped cast-iron bearers having rectangular bearing surfaces, the angular point being downwards. Thus a section of the bearing part of the rail across its length is a right angle, with its vertex downwards. By this peculiar shape the sustaining area is increased, a greater resistance to vertical pressure is consequently obtained, and the lateral stability of the rail is secured. The rails are to be laid in earth, ashes, or broken stone and gravel, and the sustaining surface of the earth may have any requisite density communicated to it by rolling or beating the earth at the sides, so as to give it sufficient density to resist the pressure to which the rail is to be subjected. The mass being composed of materials which will not readily yield or slip away, will be capable of farther condensation by any subsequent pressure not exceeding that to which it had been originally subjected by the beaters or rollers acting at the sides.

"The rails which Mr. Reynolds uses are of two kinds; rails wholly of cast-iron, cast in one piece, and rails either of wrought or cast-iron laid on a sill of wood, the wood being placed in a cast-iron bearer of the shape already described. The rails, sills, and bearers in this latter construction, break joint with each other, and are held together by bolts passing through all three. Thus one continuous structure is formed throughout the whole line, and the fracture of the three parts in the same place is highly improbable. The vibrations will be neutralized by the sill of wood acting as a partially elastic cushion in receiving the concussion to which the rails are subjected; and this latter mode of construction is considered preferable, as admitting of the use of either cast or wrought-iron rails."

"February 21, 1837.—Bryan Donkin, Esq., V.P., in the Chair.

"The construction of railways on the principle of continuous bearing, as adopted by Mr. Reynolds, and described in his paper, read at the last meeting, was discussed. Some of the rails and bearers cast in a single piece having been laid on Chatmoss, inquiries were made as to how they had answered. It was stated, that they were kept in order at less trouble than the others, and that they showed no tendency to sink. It was intended to use the commonest timber for the sills; the wood having been boiled in tar, and allowed to cool in the tar, becomes so saturated with tar that it will not imbibe moisture.

"'*A Steam Expansion Table; by George Edwards, M.Inst. C.E.'*

"In the paper explanatory of this table the author remarks, that it has become a matter of interesting inquiry, why the expansive property of steam is as yet so little used, when attention has been directed so much to the economizing fuel by improved boilers, and other similar means; and the more so as patents were taken out by Hornblower in 1781, by Watt in 1782, and by Woolf in 1804, for working steam expansively. The objections to the use of high pressure steam may perhaps be an obstacle, but there are many cases, as in the engines of tug-boats, to which these objections cannot apply.

"Very incorrect notions having existed of the expansive properties of steam, the author has, according to the admitted law, 'that (the temperature being constant) the bulk is inversely as the pressure,' constructed a table, showing at one view the resulting pressure on the expansion of a given volume of steam of given density, and *vice versa*.

"Mr. Edwards then describes the construction and method of using the table, so as to answer at once questions similar to the following: 'Required, the pressure of 60 lb. steam when expanded three times its volume.' 'In a high-pressure engine, working expansively, required the length of the stroke at which to cut off the steam, that the pressure may be 14 lbs. at the end of the stroke.' In a Woolf's engine, working 54 lb. steam, required the capacity of the larger cylinder, the smaller being unity, so that the pressure of the steam shall be 4 lbs. on the completion of the stroke of the large piston,' &c. &c.

"With respect to the principle on which this table is calculated, it was stated that the temperature does not remain constant, and that the pressure falls off most rapidly on the steam being cut off, and reference was made to some experiments made by Mr. John Taylor on this subject."*

"February 28, 1837.—The President in the Chair.

"'*On a peculiar form of Rail, and the Construction of Railways in America and Germany; by Herman Koehler, of Leipzig, M.Inst. C.E.'*

"The pattern, which the author describes, is by American engineers called the inverted T rail (⊥), and was introduced in order to avoid trouble and expense, which railways are liable to where the rails are placed in chairs and fastened with keys. The material used for this need not be of first quality, but in cases where it is expedient to support a general confidence in the quality of the iron, good and sound rails can be made of two-fifths of No. 2, Welsh iron, and three-fifths of No. 3, employing the better quality for the head and bottom, and No. 2 for the stem of the rail, rolled in such manner that the lamina of the iron lie horizontally throughout.

"The experience of all railways seems to confirm the opinion that chairs and keys to keep the rails firm to their places are a great and expensive inconvenience, and a dangerous construction, whether wood or iron be the material of the keys. The author then details the advantages of the rail, especially if laid on a continuous line of stone or wooden sleepers at a small distance apart.

"Wooden railways are at this time used in Germany, and the author has laid nine miles between Leipzig and Dresden. Wooden sleepers, 8 inches square, are placed upon trenches cut across the embankment at every yard, and filled up with a bed of broken stones, one foot deep. Notches 3½ inches deep are cut into these cross-ties to receive the wooden rails of 6 by 9 inches, which are shod with iron plates of one inch thickness and 2½ inches width. At their joints they put together, on iron plates one-eighth of an inch thick, to prevent their being pressed into the wood. The rails are wedged firmly to the sleepers by wooden wedges. The head of the spikes with which the iron rails are fastened to the wood are of a conical form, and fit into corresponding holes, these having an elliptical form to prevent the spike from being drawn or bent on the contraction and expansion of the iron rail. The ends of every iron plate rail are fastened with screw-bolts, passing through the whole height of the wooden rails, firmly to their places, which is a very important precaution, as the engines are apt to catch the points of the plate rails with their wheel flanches and to run off.

"'*A Drawing and Description of a new Lewis, by Henry Robertson, Glasgow.' Communicated by the Author.*

"The proposed Lewis consists of two pieces of iron, whereof each is a bent lever, connected at a joint by a strong bolt. When the upper or longer arms are drawn together by the power, the under or shorter arms inserted into the hole are forced against the sides, and, by properly increasing the proportion of the upper to the under arm, any necessary power may be given to the instrument.

"The advantages of this Lewis, as compared with the one of three pieces in general use are, that it can be inserted into and removed from the hole in far less time; it adapts itself to the form of the hole, all fitting and plugging with slips of iron being unnecessary, and exerting its pressure directly against the sides of the hole, is less apt to chip off the edges and endanger the falling of the stone.

"'*Experiments on the Strength of various kinds of American Woods exposed to a Transverse Strain; by Lieutenant Denison, of the Royal Engineers, A. Inst. C.E.'*

"These experiments were undertaken with the view of establishing, first, some common standard of comparison between the woods in general use in that country

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* "See *Minutes of Conversation*, March 1, and 8, 1836."

and in our own; and secondly, to ascertain the change in strength caused by seasoning. The latter series of experiments, unfortunately, was not made."

"March 7, 1837.—The President in the Chair.

"'*On Experiments on the Strength of Materials. By Thomas Webster, M.A., Sec. Inst. C.E.*'

"The object of this paper was to point out the importance, in making experiments on the strength of materials, of beginning with weights sufficiently small. In the series of experiments on the strength of various timbers by Lieutenant Denison, laid before the last meeting of the Institution, the first weights are in some cases too large, for from the commencement the deflection increases more rapidly that the imposed weight.

"The points to be ascertained in all experiments of this kind are, first, the weight which a beam can bear, the elasticity being unimpaired, or the Elastic Weight; and, secondly, the Breaking Weight. So long as the deflection increases in exact proportion with the increase of the weight, we may consider that the elasticity is unimpaired; but if the deflection increases in a higher ratio, that is, if the deflection for one cwt. be *one* inch, and for two cwt. more than *two* inches, we may suspect that some violence is done to the elastic force of the material. Thus a guide is furnished us in our observations; the weight before which this ratio is observed to change must be considered as the Elastic Weight. When a beam is to be broken, the effect of time should be noticed, and the increased deflection after a given number of seconds recorded.

"The experiments of Lieutenant Denison bear out these remarks; for it will be seen, that the point at which he has noted the first permanent set is, in very many cases, immediately after the change which is here laid down as the condition for determining the elastic weight.

"With respect to the strength of materials, Mr. Cottam stated that it had often occurred to him, whether, if a beam be loaded by ever so small a quantity beyond the Elastic Weight, this beam would not in time be broken. This consideration might, he thought, explain some apparent difficulties, as when a beam breaks suddenly without any increase in the weight, but having been loaded to the same amount for many years.

"Mr. Hawkins mentioned a case, in which a beam that deflected too much had been sawn down its middle and bolted up, so that its depth was increased in the centre from 10 to 11 inches. The effect of this was, that the deflection, instead of being about 1¼ inch, was only one-eighth of an inch. Was this great increase of strength to be attributed to the increase of depth simply, or to the lower half having become a truss and the upper a strut?"

"March 14, 1837.—The President in the Chair.

"The decay of timber in contact with stone was discussed, and several instances were mentioned in which the only decayed part of timber was that in contact with stone. This decay is entirely obviated by inserting the wood in an iron shoe, or by placing a thin piece of iron betwixt the wood and the stone. Several cases were mentioned in which the iron shoe had been found a complete protection against dry rot and decay; a hard crust is formed on the timber in contact with the iron, which seems effectually to preserve it. It was suggested that the system of grouting must contribute to the early decay of timber; bond timber had consequently been replaced by bond iron. Bond timber is used very generally at Manchester, and answers exceedingly well, but the high temperature of the buildings may be a preventive against the decay of the timber, as the walls are very soon dried.

"The subject of the strength of materials was resumed from the last meeting, and especial reference was made to the experiments by Mr. Hodgkinson on the strength of iron girders, published in the Transactions of the Manchester Society. In this paper Mr. Hodgkinson supposes the forces of extension and compression to have a ratio ꞉ : u; and not that, within the elastic limit at least, this ratio is a ratio of equality.

"Also, these experiments are directed especially to determining the form of beam which will be strongest up to the instant of fracture; or, in other words, the beam which will have the greatest breaking weight without any reference to the elastic weight.

"These principles are contrary to those laid down by Tredgold, and to the opinions of many persons of great experience. Mr. Donkin and Mr. Francis Bramah maintained that within the elastic limit the forces of extension and compression are equal; that consequently within this limit the deflection will be the same, whether the beam is laid with a particular edge highest or lowest; that a beam, for instance, whose section is a triangle, will exhibit the same deflection within the elastic limit, whether the vertex or base of the triangle be laid uppermost; beyond this limit, however, the case is different.

"The strength of a beam, according to Mr. Hodgkinson's experiments, depends on the bottom flanche; by increasing this he had made beams for which the breaking weights were 4000 the square inch of surface of section, whereas Tredgold's strongest forms were about 2500 the square inch."

EXTRACTS FROM PAPERS READ BEFORE THE ROYAL SOCIETY, 1836.

"*On certain Parts of the Theory of Railways. By the Rev.* DIONYSIUS LARDNER, *LL.D., F.R.S.*

"THE author observes, in his prefatory remarks, that an extensive and interesting field of mathematical investigation has been recently opened in the mechanical circumstances relative to the motion of heavy bodies on railways; and having collected a body of experiments and observations sufficient to form the basis of a theory, he purposes, in the present paper, to lay before the Society a series of mathematical formulæ, embodying the most general expressions for the phenomena of the motion of carriages on these roads.

"The author begins by investigating the analytical formulæ for the traction of trains over a level line which is perfectly straight, and finds, first, the distance and time within which, with a given amount of tractive power, the requisite speed may be obtained at starting; and also the point where the tractive power must be suspended, previous to coming to rest. The excess of tractive power necessary to get up the requisite speed is shown to be equal to the saving of tractive power previous to a stoppage; and formulæ are given for the determination of the time lost under any given conditions at each stop.

"The motion of trains in ascending inclined planes which are straight, is next considered; and formulæ are given combining the effects of friction and gravity, in opposition to the tractive force. The circumstances which affect every change of speed, and the excess of tractive force necessary, in such cases, to maintain the requisite speed, are determined; as well as the other circumstances already stated with respect to level planes.

"The friction of trains upon descending planes is next investigated, and an important distinction is shown to exist between two classes of planes; viz., those whose acclivities are inferior to the angle of repose, and those of more steep acclivities. A remarkable relation is shown to exist between the tractive forces in ascending and descending the first class of planes. For descending planes of greater acclivity than the angle of repose, the use of breaks becomes essentially requisite. The effect of these contrivances is investigated, as well as the motion of trains on the accidental failure of breaks.

"In any attempts which have been hitherto made to obtain the actual velocities acquired by trains of carriages or waggons under these circumstances, an error has been committed which invalidates the precision of the results, the carriages having been treated as sledges moving down an inclined plane. The author has here given the analytical formulæ by which the effect of the rotatory motion of the wheels may be brought into computation; this effect, depending obviously on the amount of inertia of the wheels, and on the proportion which their weight bears to the weight of the waggon.

"The properties investigated in this first division of the paper, are strictly those which depend on the longitudinal section of the line, presumed to be straight in every part of its direction. There is, however, another class of important resistances which depend on the ground-plan of the road, and these the author next proceeds to determine.

"The author then gives the analytical formulæ which express the resistance arising,—*first*, from the inequality of the spaces over which the wheels, fixed on the same axle, simultaneously move; *secondly*, from the effort of the flanges of the wheels to change the direction of the train; and *thirdly*, from the centrifugal force pressing the flange against the side of the rail. He also gives the formulæ necessary to determine, in each case, the actual amount of pressure produced by a given velocity and a given load, and investigates the extent to which these resistances may be modified by laying the outer rail of the curve higher than the inner. He assigns a formula for the determination of the height which must be given to the outer rail, in order to remove as far as possible all retardation from these causes; which formula is a function of the speed of the train, the radius of the curve, and the distance between the rails.

"In the latter part of the paper, the author investigates the method of estimating the actual amount of mechanical power necessary to work a railway, the longitudinal section and ground-plan of which are given. In the course of this investigation he arrives at several conclusions, which, though unexpected, are such as necessarily arise out of the mechanical conditions of the inquiry. The first of these is, that all straight inclined planes of a less acclivity than the angle of repose, may be mechanically considered equivalent to a level, provided the tractive power is one which is capable of increasing and diminishing its energy, within given limits, without loss of effect. It appears, however, that this condition does not extend to planes of greater acclivities than the angle of repose; because the excess of power required in their ascent is greater than all the power that could be saved in their descent; unless the effect of accelerated motion in giving momentum to the train could properly be taken into account. In practice, however, this acceleration cannot be permitted; and the uniformity of the motion of the trains in descending such acclivities must be preserved by the operation of the break. Such planes are therefore, in practice, always attended with a direct loss of power.

"In the investigation of the formulæ expressive of the actual amount of mechanical power absorbed in passing round a curve, it is found that this amount of power is altogether independent of the radius of the curve, and depends only on the value of the angle by which the direction of the line on the ground-plan is changed. This result, which was likewise unexpected, is nevertheless a sufficiently obvious consequence of the mechanical conditions of the question. If a given change of direction in the road be made by a curve of large radius, the length of the curve will be proportionably great; and although the intensity of the resistance to the tractive power, at any point of the curve, will be small in the same proportion as the radius is great, yet the space through which that resistance acts will be great in proportion to the radius: these two effects counteract each other; and the result is, that the total absorption of power is the same. On the other hand, if the turn be made by a curve of short radius, the curve itself will be proportionately short; but the intensity of the resistance will be proportionately great. In this case, a great resistance acts through a short space, and produces an absorption of power to the same extent as before.

"In conclusion, the author arrives at one general and comprehensive formula for the actual amount of mechanical power necessary to work the line in both directions; involving terms expressive, *first*, of the ordinary friction of the road; *secondly*, of the effect of inclined planes, or *gradients* as they have been latterly called; and, *thirdly*, of the effect of curves involving changes of direction of the road, the velocity of the transit, and the distance between the rails; but, for the reason already stated, not comprising the radii of the curves.

"Although the radii of the curves do not form a constant element of the estimate of the mechanical power necessary to work the road, nevertheless they are of material consequence, as far as regards the safety of the transit. Although a short curve with a great resistance may be moved over with the same expenditure of mechanical power as a long curve with a long radius,

yet, owing to the intensity of the pressure of the flange against the rail, the danger of the trains running off the road is increased: hence, although sharp curves cannot be objected to on the score of loss of power, they are yet highly objectionable on the score of danger.

"In the present paper, the author has confined himself to the analytical formulæ, expressing various mechanical effects of the most general kind, the coefficients and constants being expressed merely by algebraical symbols: but he states that he has made an extensive series of experiments within the last few years, and has also procured the results of experiments made by others, with a view to determine the mean values of the various constants in the formulæ investigated in this paper. He has also, with the same view, made numerous observations in the ordinary course of transit on railways; and he announces his intention of soon laying before the Society, in another paper, the details of these experiments, and the determination of the mean values of these various constants, without which the present investigation would be attended with little practical knowledge.

"*On the Valuation of the mechanical effect of Gradients on a line of Railroad.*" *By* PETER BARLOW, *Esq., F.R.S.*

"The exact amount of the influence of ascents and descents occurring in the line of a railway on the motion of a load drawn by a locomotive engine having been differently estimated by different persons, the author was induced to investigate the subject. A few observations are premised on the erroneous assumptions which, he conceives, have in general vitiated the results hitherto deduced. The first of these is, that the expenditure of power requisite for motion is equal to the resistance to traction, whereas it must always greatly exceed it. No account, he remarks, has been taken of the *pressure* of the atmosphere on the piston, which the force of the steam has to overcome before it can be available as a moving power. Another source of error has been, that the statical and dynamical effects of friction have been confounded together; whereas they are the same in amount only when the body is put in motion by gravity, but not when it is urged down an inclined plane by an extraneous force. In the latter case these effects are no longer comparable, friction being a force which, in an infinitely small time, is proportional to the velocity, while that of gravity is constant at all velocities; or, in other words, the retardation from friction is proportional to the space described, while that from gravity has reference only to the time of acting, whatever space the body may pass over in that time. It is an error to assume, that the mechanical power of the plane is equivalent to a reduction of so much friction; for the friction down the inclined plane is the same as on a horizontal plane of the same length, rejecting the trifling difference of pressure; and the whole retardation in passing over the plane, or the whole force required to overcome it, is the same at all velocities, and by whatever force the motion is produced; but the assisting force from gravity is quite independent of the space or of the velocity.

In the investigations which the author has prosecuted in this paper, he assumes that equal quantities of steam are produced in the same time at all velocities; and he adopts for his other data, those given by Mr. Pambour in his Treatise of Locomotive Engines. He deduces a formula from which, the speed on a level being given, we may compute the relative and absolute times of a train ascending a plane, and consequently also the ratio of the forces expended in the two cases, or the length of an equivalent horizontal plane; that is, of one which will require the same time and power to be passed over by the locomotive engine as the ascending plane.

"The next objects of inquiry relate to the descent of trains on an inclined plane, and comprise two cases: the first, that when the power of the engine is continued without abatement; and the second, that when the steam is wholly excluded, and the train is urged in its descent by gravity alone. The author arrives at the conclusions, that in the first of these cases, when the declivity is one in 139, the velocity on becoming uniform will be double that in a horizontal plane; and that for a declivity of one in 695, the uniform velocity of descent will be one-fifth greater than on the horizontal plane; and this, he observes, is perhaps the greatest additional velocity which it would be prudent to admit. A plane of one in 695 is therefore the steepest declivity that ought to be descended with the steam-valve fully open; all planes with a declivity between this and that of one in 139 require to have the admission of steam regulated so as to modify the speed, and adjust it to considerations of safety; and lastly, all planes of a greater slope than this last require, in descending them, the application of the brake."

ORIGINAL PAPERS AND COMMUNICATIONS.

ON THE STANDING ORDERS, PRACTICE, AND FEES OF THE HOUSE OF COMMONS.

WE are happy to find that the Standing Orders of the House of Commons are yet under consideration, and that the Speaker is pledged to re-open the subject. No doubt, there is much to do, and with equal certainty we may add, there is much to *undo*. Last session the House, in trying to remedy one evil, created another and a greater. During the mania of speculation, it is certain that there were dishonest schemes as well as honest schemes, foolish ones, as well as wise ones impracticable as well as practical and useful. This evil no one affects to doubt; yet taking it to be the extent of accusation (which was immeasurably beyond the extent of proof), still we think it would not augur "absolute wisdom" to say there shall be *no schemes of public improvement at all.* It is like cutting off the head of a patient to cure a pimple on his nose, or a wart on his thumb; yet, to this extent the House of Commons has gone, by its Standing Orders of last session, as to Railways. We believe, there is not a solitary new railway projected, or rather propounded to Parliament this session. We have heard it argued, and that too successfully, in the very same House that has thus arrested the making of those internal communications which vastly augment the capabilities and wealth of the country—we have heard it argued in that same House, that it was good for the country to employ its capital and its people, by digging holes one day and then filling them up the next; but very, very different is the doctrine now held. The "surplus population" are not to be employed in even useful labour—the sacred right of private property is to be invaded, and men are not to be allowed to expend their capital as they please, because, forsooth, some projectors have been too sanguine, and some speculators too silly—men's money is to be kept in their pockets by Act of Parliament! You may throw away thousands on the bonds of other countries, if you please—you may gamble as much as you like in your own—you may visit aristocratic or democratic "hells," to your heart's content;—nay, you may meet with "grave and *legislative* seigniors—your much approved and very honoured masters," who, thus restraining you from ruining yourself in your own way, ruin you in theirs;—but your public ways you must not amend, railroads you must not make, branches, necessary and calculated upon to join the great trunks, must be suddenly and forcibly arrested, rendering these very trunks unprofitable, unpopular, and consequently unsuccessful, and all this must be done to punish the country for having acted upon the opinion which the Right Honourable Sir Robert Peel, amid the cheers of that very House, expressed in favour of the making and maintaining of railways throughout the country!

It really is at once lamentable and laughable to observe the glaring inconsistencies of the House of Commons. This year, railroads are all the rage, and the people are cheered on to their support—the next, they are worthless and senseless speculations, and the people must be debarred from engaging in them. *Now* we have honourable Members acting as Directors, or perhaps more often as shareholders, by wholesale, and *now* we see exactly the same men, after having sold out, the foremost to denounce the very system of which they had previously been the patrons! Nevertheless it must be confessed they were evils, and these evils required correction; but let us see what those evils were.

Now, the great, the *proved* evil of some of these schemes was the extent to which they had been made the subjects of gambling speculations. Men not worth a farthing had been put forth as subscribers to the parliamentary deeds, and holders of large interests, by others who obtained shares in their names, not choosing to risk their own names, and then sold the shares so obtained at a premium. This was a fraud upon the Standing Orders, which required that a certain and increasing proportion of capital should be subscribed before each House assented to the bill. Again, false representations were used as to the demand for shares, which made those shares, from the supply being considered inadequate to such demand, to rise to a premium. This was a fraud upon the public. Here were two frauds, one upon the Legislature, and the other upon the speculator, but both had a common origin, and could be defeated by a common blow. How easy would it have been to have enacted, that no shares should have been transferable, until acts of parliament were obtained, and that in the mean time, all transfers should be void or voidable at common law.

We have hinted at one remedy for acknowledged evils*; let us now look at remedies for other evils in the practice of parliament itself, not so much acknowledged, but nevertheless just as certain and injurious.

1st.—Why are the Standing Orders of the two Houses so inconsistent with each other, as to the deposit of plans, sections, &c., the Lords requiring such deposits to be made in November, and the Commons in the previous month of March?

2ndly.—Why do the Orders of the Lords require a deposit of only five per cent., those orders coming into operation in the later stages of a

* Every system of persecution, expense, and delay was resorted to, during the last session of Parliament, by the House of Commons, to prevent Railway Bills passing in the Standing Orders Committee, where the most trivial objections were allowed in rejecting bills for non-compliance of the new Standing Orders. In one instance, because a building (not included in the Schedule, nor intended to be included in the Act, nor required for the purposes of the Railway), coming within the range of 100 yards of the line of Railway laid down, was not shown at large, it was decided that it was a non-compliance of the Standing Orders; in another case, because a cow-shed was omitted to be shown at large, it was decided that the parties had not complied with the Standing Orders; in another instance, because there happened to be a border of shrubs surrounding a meadow, it was decided that it was a garden or pleasure-ground, and ought to be shown at large, consequently that bill was rejected; and several other instances of injustice could be pointed out throughout the different stages of the bill. And it is notorious, that the Parliamentary Agent who can muster the largest attendance of members, or count the *most noses* in his favour, in the Committee on the bill, procures the greatest share of business;—the practice from beginning to end is generally conducted in the most slovenly, unjust, and expensive manner possible.

bill, while those of the Commons require ten per cent. at much earlier stages?

3rdly.—Why is it necessary to repeat all the proofs before a Committee of the House of Lords, after they have been recorded by a Committee of the House of Commons, to the enormous cost of the suitors?

4thly.—Why are such enormous fees exacted as to be ruinous alike to suitors and opponents, and especially after the Courts of Law have reduced all their fees to a very moderate amount?

5thly.—What becomes of the money so exacted as fees? and why should private suitors be compelled to pay for the proportion of clerks and officers required for the public business of the country?

6thly.—Why should Members be allowed to vote on the preamble of a bill being proved, who have not heard a word of the evidence?

We shall add a few more queries in our next, and keep this important subject, as well as all the proceedings of Parliament on private bills, constantly before our readers.

OBSERVATIONS ON THE NEW HOUSES OF PARLIAMENT. BY MELA BRITANNICUS.

Sir,—Allow me, through the medium of your Journal, which bids fair to be of extensive utility, to raise one voice, however feeble, not only against the proposed plan of Mr. Barry for the New Houses of Parliament, but also against the site. Though not professedly an architect, the study of architectural works has occupied very many hours of my time during extensive travels through England, France, Italy, and Germany; and without vanity I may assert, that I have at least an experienced eye, and strengthened not a little my judgment. Without further preamble, I will state at once my reason for objecting to the site. Aware as I am of the great difficulties that invest all topics of this nature, I will couch my criticism chiefly in the interrogatory form. And in the first place, I ask with what view has the proposed site been chosen by the architect? Can any one be blind to its being one of the soottiest, lowest, and consequently dampest, that the metropolis affords? Is our veneration for the position of St. Stephen's, and the *infallible* wisdom of our ancestors, to supersede every other consideration? Why incur the heavy expense of a vast embankment, which the choice of a site remote from the Thames, consequently drier and healthier, would render unnecessary? Would it not be more plausible to leave the venerable Westminster Hall in the centre of three sides of a square, two of the sides presenting gable ends parallel with the end of the Hall, and in the first and simplest Gothic, devoting the Hall, and its environing appurtenances, to the gentlemen of the long robe *only?* Surely this will appear far preferable to the great majority of architects and amateurs to the plan proposed by Mr. Barry; for what a Babel of architecture must meet the eye from his huddling together the old Hall and new buildings, both of different styles!—Vitruvius ranks among the first qualifications of an architect the judicious choice of a site, in which, I fear, Mr. Barry, if his plan be adopted, will prove himself, or his employers (for architects have often this *salvo*) very deficient; for the fogs and smoke of London, the bane of architecture, brood in the site of the old Houses of Parliament as much as in the City itself. To diminish this disadvantage as much as possible; what position then would a happier *coup-d'œil* than that which the architect and his employers possess propose? Without pretending to declare it the best, I should select, as preferable, the site of old St. James's Palace,—a vile heterogeneous fabric, on the demolition of which no one, I guess, would write an elegy. The style should be Elizabethan, that being an order characteristically British; each of the Chambers to have two vast oriel windows looking towards the Park; the avenue to Buckingham House to be cut down; the whole building to be of stone; the interior of the House of Lords to be impannelled with Norway oak; the principal mouldings, with the roses and other ornaments in the ceiling, to be set off with the richest gilding. A similar plan might be adopted for the lower Chamber with less splendid ornament. The throne for our young and amiable Queen to be simply a chair of British oak, and of the richest Elizabethan form, with a simple velvet crimson cushion, and not presenting, as in the consumed House, a glittering and ridiculously expensive gew-gaw. The advantages of this site would be very great in reference to its contiguity to the New Palace, situated within two stones' throw; while the only disadvantage would be a five or six minutes' walk through Storey's Gate for the lawyers who might be summoned to attend either House. But this inconvenience would nearly be done away by having apartments annexed to the Houses for the reception of those lawyers who might be called to either House. Were this plan to be adopted, only consider the difference of the estimated expenditure. Two different estimates I have seen of Mr. Barry's project; one of £500,000, the other of no less a sum than 700,000 and odd pounds. With the fullest confidence I assert, that my three sides of the new square to enclose Westminster Hall, to be devoted only to legal affairs, would not cost more than £60,000, built of best brick, and faced, as would be sufficient both for effect and solidity, with four inches of best Portland stone, worked in the style of the earliest Gothic epoch.

I can, too, with equal confidence assert, that the sum of £440,000 would be sufficient, in the hands of an intelligent architect, to build in the first manner, and all of the best stone, the Elizabethan fabric, which he could arrange, with all its necessary appurtenances of library, record, committee, and waiting-rooms, for the above sum. Thus, if the estimate of 700,000 and more pounds be devoted to Mr. Barry's work, my St. James's Park and Westminster plans would be covered by the first estimate, viz. £500,000. But enough of objections relative to the site of the new florid Gothic Houses; proceed we to the reasons why I, and luckily for me, many hundreds of others, reprobate the style of Mr. Barry's plan. And first, I ask, did the architect and his controllers consider duly the nature of the English climate and atmosphere, before he or his employers favoured us with his florid specimen of Gothic? Did they turn their eyes to the condition of Henry the Seventh's Chapel, which, though thoroughly cleansed * some ten or fifteen years ago, has now nearly the same begrimmed complexion as its parental abbey? And what is the cause of this dingy hue, the bane of all delicate architecture for at least a six-mile radius from the centre of London? The neglect, I reply, of adopting the simplest style of Gothic, if it be to be adopted; though, I apprehend, that every wise architect would rather prefer, if not the Elizabethan, which has fewer mouldings, the Tuscan and Doric of Palladio, Scamozzi, or Vignola. But waiving further disputations on style, is it not extraordinary that the architect, having the example of the untoward effect of Henry the Seventh's Chapel before his eyes, should have persisted in giving us a plan of even richer Gothic, consequently presenting more nests for the deposit of the soot? Unfortunately, the London atmosphere is, of all others perhaps on our globe, the worst adapted for the exhibition of the delicacies of any florid style of architecture, and the last character of Gothic may be as plausibly reprehended for adoption, as might be the richer ornaments of the architecture of Asia Minor, or the Arabic of the Alhambra, or the yet more delicate chiselings of the Tâj-Mâl at Agra. It will be vain to refer, in answer to the authority of the wisdom of our ancestors, whose skill, though often to be praised, was as yet in its infancy, and who had much to say in vindication of their errors, seeing that London sent not forth in their time the ten-thousandth part of the volumes of smoke that it does now. I pretend not to criticise Mr. Barry's interior, not possessing the necessary data whereon to ground my judgment; but to return to the consideration of his exterior plan, I ask, what meaneth that centipedal tower, necessarily of exorbitant cost, with which he menaceth us? Towers, as authorized by Gothic architecture, are of two kinds, military and ecclesiastical. A tower attached to a castle we all feel to be in its element, as is a tower attached to a church, to serve as a belfry. Doth he mean that cannon should be pointed from it downwards to keep Radicals and Conservatives in proper order? If so, I object not, in an architectural sense, to his tower. Or doth he mean, that a belfry should be attached to it to summon our Queen and both Houses to their duty, a rope attached to a clapper above, and close to the Speaker's chair, to spare him the trouble of crying "Order!" If so, I know not that the tower is condemnable, unless it be in the triple view of its entailing a vast and useless expenditure, of being a very inconvenient receptacle for the records, and of its exterior presenting a mass of smoky blackness within ten years after its erection. I am aware that many may urge, in reply to my criticism, "Would, then, your Houses, built on the site of St. James's Palace, be free from smoke?" Not altogether, but in a much less degree, I answer, with the additional advantages of sparing the cost of the great embankment; of presenting a drier, healthier, and more cheerful place of rendezvous for both Chambers, and of being far more easy of access for our Sovereign, peers, and representatives.

Would not, I ask, a judicious architect renounce the site of St. Stephen's, not only for the above-mentioned reasons, but also from the consideration of the bad effect of so many vast edifices being cumbrously piled in the immediate neighbourhood? First, we have the old Hall, one of the largest in Europe; then comes, within a stone's throw, the old murky Abbey, from which the sweepers might collect at least one hundred bags of soot; within twenty paces of this stands St. Peter's Church, as untowardly situated as possible; a hundred yards behind rises the Westminster Hospital; and now we are to have the vastest Gothic pile ever conceived within a stone's throw of all these buildings!

Is it not extraordinary that the architect was unable to foresee that the sootty vapours must be accumulated in a tenfold degree more than heretofore, from the circumstance of such a multitudinous assemblage of piles being so closely huddled together, and necessarily diminishing the circulation of the air? that this confined contiguity must also reciprocally destroy the effect of each building? Have we not reason to wonder that the least experienced of the amateur commissioners should not have been struck by these conclusions? that they, as well as many members of either House, should have hesitated for a moment to open every battery of opposition to the adoption of the old site? "No, no," they cry, or in nearly tantamount words, "better be stoned like St. Stephen than abandon the site of his venerable chapel. Who cares whether a building be black or white? Destroy, indeed, the noble pile of St. James's, the favourite abode of our beloved eighth Henry; that fabric which attracts and fixes the eyes of all Europe, to make way for our new Houses of Parliament! As well might be proposed the pulling down of St. Paul's, or the new bridge of Waterloo."

But, Sir, it is useless to preach against the force of prejudice, more remarkable in this country, in many particulars, than in any other. Of this delectable element of mind John Bull has always quaffed his full measure; and had the wisdom of his ancestors decreed to fix the two Houses of his Parliament close to the foggy Whittlesea mere, and had a travelled person suggested sundry other spots more preferable, honest John would not fail to exclaim, "Whittlesea mere was ordained by my ancestors to be the eternal site of the Parliament Houses, so shall it remain." It is this same prejudice that blinds so many of us to the absurdity of the Thames Tunnel, a work which has been interrupted by three or four irruptions, which in a commercial view is comparatively useless, seeing the neighbourhood of the bridges; which impales with rheumatism for life, or subjects to drowning, so many clever workmen; which few will enter, if ever completed, but once or twice for curiosity; and

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* It was re-cased with Bath stone.—*Editor.*

which, if by dint of vast labour it may be rendered at first tolerably free from dripping, cannot long remain so, from the percolating effect of the action and re-action of the tides; to a work, in short, which can confer no credit to the architect and his advisers, the primary error being the too inconsiderable descending curve. To return to the great question of the Houses of Parliament, wherein so many important considerations lie, perhaps something might be effected for furthering the adoption of a more advantageous site and plan, by those artists and amateurs who may side with me in opinion (and I know there are several), signing a powerful protest against the work in agitation, and submitting it through some Member to any future Committee. Let us hope, however, for the honour of sound taste and judgment, that the Commissioners have not irretrievably adopted this, in my opinion, highly objectionable plan of Mr. Barry. I know not the man, neither do I foster against him the least personal grudge. Let us hope, I repeat, that before final adoption, they have yet time to weigh most scrupulously every detail of a plan which involves so great an expenditure, and wherein our character as to discretion in a work destined for centuries, both in relation to our posterity and enlightened foreigners, is so eminently concerned.

MELA BRITANNICUS.

RAILWAY ACCIDENTS, BY AN OLD ENGINEER.

The extraordinary encouragement given to railway projects, upon the success attending that of the Liverpool and Manchester Company, of 32 miles in length, the confident anticipation that, to make the system one of universal adaptation, whether of locality or speed, was purely a matter of outlay and calculation, were the leading features of the speculative period of 1835. At that time it was expected, that as railway extension took place, railway science would improve with it, and that those new events, and new features which circumstances produced, would be met by corresponding mechanical expedients. Unfortunately, such is not the case; railways are now identically the same, with one exception, in construction and detail, with that of the Liverpool and Manchester. Is that perfect? If the accidents which are happening perpetually upon the various lines already open to the public be taken as the reply, it is one most decidedly negative.

Considering the costly nature of railway apparatus, it would seem the interest of railway directors to avail themselves of every contrivance by which their property would be secured. The destruction of a locomotive and train of five carriages would be a loss in value of upwards of 3000*l.* for the engine and carriages alone, without taking into account the loss of property for which the company may be liable, or the loss of life to the public; but it is a melancholy fact, within the personal experience of the writer of this article, that railway companies are decidedly opposed to any and every suggestion by which the system may be made safe, or generally improved, unless such suggestions emanate from their own engineer, a person who, in numberless instances, is noted rather for his influence than for his acquirements; and this observation particularly applies to the sub, or resident engineer, who, seven cases in ten, is the mere nominee of a powerful director, and if he be distinguished at all, it will only be in his profound ignorance of mechanical matters. A railway is essentially a mechanical enterprize, and no man ought to be entrusted with its management, unless he be well skilled as a practical mechanic. He ought to be a man of the most clear mind and profound judgment, a man capable of deciding at once whether a contemplated arrangement shall be attended with the desired result, not a man who can make a pretty report, or a neat drawing merely, or, perhaps, run down a level after a month's practice, but, in the case of a mechanical want, must run about to every forge and work-bench in the establishment before he is able to make up his mind, or select his measure. He ought to be, not a mere mechanic, but a man of invention, for so crude is the system at present, that to make it perfect and profitable, a man ought to be within call, ever ready with an expedient to supply wants as they arise. Men such as I have described are few, but they are to be found, and it would redound beyond calculation to the interest of railways, if the directors, in selecting their technical officers, were to cause them to pass a rigid technical examination before disinterested and skilful judges, with the same view as, in the medical and legal professions, a rigid examination is entered into before an applicant for honours is allowed to practise.

I have dwelt at some length upon this branch of the subject, because I have unfortunately observed, in some companies with which I am acquainted, the sad inaptitude of the parties in charge to conduct them, and it is the same thing to the public whether a railway is unsafe or irregular from a defect in the principle, or a defect in the management; and this want of confidence is beginning already to develope itself. I perceive by the public papers, that the lines of coaches which, upon the opening of the London and Birmingham and Grand Junction Railways, had discontinued running between London and Manchester, have resumed the road, so that the bitter fruits of their accidents will be severely felt by the Railway Companies mentioned.

The locomotive, a wonderful machine though it be, is still so complex and obnoxious to so many accidents, that it becomes matter of astonishment that it should have remained so long without improvement; but the same causes operate in this, as in the cases before stated, in the discouragement given by railway directors to railway improvements. A railway company, if a projector were to place upon their line a better locomotive than they already possess, would perhaps buy it; but they would go no lengths, in a pecuniary way, in assisting a poor but clever man in bringing forward any contrivance he may propose; neither would they protect him from the enmity which would be felt and manifested by their own mechanical agents, towards his contrivance when produced. Thus it is that corporations are, in their very constitution, inimical to scientific improvement; and although the enormous funds at their disposal provide them with the means of encouraging the art to an extent wholly beyond the power of individuals, nothing is to be hoped from them; and whilst they remain as at present constituted, the probability is, that the system will retrograde, or be perhaps at last abandoned by the public in disgust. In order, however, to avert such a state of things as far as my knowledge goes, I shall point out the causes and means of avoiding the accidents which occur so frequently.

It is an usual reply to any question raised as to the cause of an accident, that the fault is in the man in charge, or that some malicious person places stones, wood, or a bar of iron across the rails. The first cause is almost always the wrong one, for the engineer has so evident an interest in avoiding an accident, that he must be a madman to cause it; but an engine and train ought to be constructed in such a way, and provided with such apparatus, as either to forbid the possibility of accidents, or when they do occur, they may be, in their consequences, harmless, and easily set to rights. In the event of an engine running off the line, means ought to be at hand speedily to replace it, and the carriage or frame of the engine and carriage so formed, as to remove impediments placed accidentally or by design across the rails; in fact, the antennæ of insects point out the remedy. If a frame were hung in front of the engine to within a very short distance of the rails, say two inches, with an apparatus at the command of the engineer to lower it, at night, or when he perceives by day any thing likely to impede his progress, the stones and timber which cause so much mischief now, might be removed or swept off by the engine itself.

In the construction of the carriage, the principle to be adopted ought to be to bring down the centre of gravity to the lowest point possible, thus making the carriage safe under all circumstances. The load, by being hung low, produces less draught upon the engine, because it approaches nearer the line of traction, viz., the surface of the rails; and linking the trains below the axle produces a valuable mechanical advantage in favour of the engine, that the load tends to assist the adhesion of the driving wheels. The system of linking, adopted upon the London and Birmingham, and other railways, is most vicious. On those lines, the carriages are screwed up until the buffers touch hard, so that they have a tendency in all cases to keep straight. Thus in going round the curves, the rigidity produced from this arrangement will act in unison with the centrifugal force, and tend to throw the carriages off the line. The action is, in fact, that of a cane, that has always a tendency to return to its original position. It is true that this screw apparatus prevents the shock of the carriages, which is so annoying when they are yoked only by chains; but in order that one difficulty may be avoided, another much worse is fallen into. In order to accomplish this object in a scientific manner, a drag spring ought to be fixed to one end of the carriage, and a buffer spring to the other; thus, when the carriages are placed in line, a drag spring and buffer spring are opposite the one to the other. These two springs, united by a double joint, leaves all the flexibility required for the curves, and the elasticity, with the absence of jolting, required for the carriage.

The form of the chair is also an object deserving much attention. A chair ought to be as little wider than the rail as circumstances will admit, for in the case of the engine running off, if the wheel should strike against a chair, such as those of the London and Birmingham line, the concussion would be dreadful, and it would throw the engine round, as happened lately upon that line. The fact is, when there is no chair or other obstacle in the way, and the ballasting carried within an inch or two of the top of the rail, no harm would arise from the accident, because the velocity of the train would be arrested gradually, by the engine wheels being opposed to a medium, producing greater resistance to their progress than the rails themselves, unless crossing an embankment, where if the embankment be very narrow, or not provided with a parapet, it is probable the engine might run down the bank, and drag the train with it.

I have seen an engine after it has run off the line, the wheels of which were scrated all round by running over the feet of the chairs, and it must have gone a distance when off the line fully equal to three revolutions or fifteen yards. Had there been these chairs, such as those on the London and Birmingham line, and like those exposed, the engine would in all probability have been dashed to pieces, and the train too.

The switches are a most important appendage to a railway. The best switches which have been yet offered to the public, are those invented by Mr. W. S. Curtis, first introduced upon the Greenwich Railway. In these switches the angle is lost, so that a train passes through them with as much smoothness as along the line. This is effected by forming the switch for the outside line of the curve double, one bar straight for the line, and the other curved to correspond with the diagonal. The inner switch may be likewise double; but it is better to form it with a pointed switch, in the common way, and a fixed rail. This produces a lighter apparatus, and the inner or passive line, it is of no consequence whether formed with an angle or not. Care must be taken to make the lever and balance weight in such way that it may be always right for the line. In laying out a railway, provision should always be made so that at the various stopping places the engine and train may draw out of the line, and leave it unoccupied, so that the line be always open. Had this precaution been taken, the fatal accident which happened in the Grand Junction Railway, some time past, would have been avoided.

Such is the anxiety, certainly pardonable anxiety, for railway shareholders to commence business, that the works are frequently hurried, and operations begun before the various embankments have had time to consolidate. I would recommend, as a sincere well-wisher to railways, that a little forbearance should be exercised, and the embankments allowed to remain until they have been well saturated with rain, and thus frosted, before the line is opened to the public. This forbearance will be well repaid, by the satisfactory and regular operations of the line afterwards.

AN OLD ENGINEER.

THE SOANEAN MUSEUM.

"Nessuno l'obliga a far questa cosa, e se la fa, la dee fare grandiosamente, e non con sordidezze e spilorcerie."—Mota.

In defiance of the proverb which cautions us against looking a gift horse in the mouth, we cannot forbear looking at the Soane donation to the public, in doing which we can hardly be accused of prying into matters that do not at all concern either ourselves or our readers. Neither can we look at it long before discovering that, so far from being, as some have chosen to style it, a "munificent and patriotic bequest to the nation," it is the mere mockery of one, a most notable piece of show and delusion,—a gift wherein the donor evidently consulted his own vanity more than any thing else, and at last bestowed it so ungraciously and parsimoniously as to manifest the very reverse of a generous or even a loftily ambitious spirit.

As to the house itself, it is generally well known to have been Sir John's favourite hobby; and from first to last he probably expended upon it as much as would have sufficed to rear a mansion and galleries four or five times the extent of the present building. In fact, independently of the gallery which extends behind that and the adjoining dwelling, the house does not at all exceed a moderate-sized one, with two drawing-rooms on the first floor. In making this observation, however, we do not deny that it exhibits much ingenuity and many contrivances, very clever in themselves, as ideas and hints—but at the same time a great deal that borders upon meanness and insignificance—much that partakes of littleness no less than of whim, with much also that looks no better than a temporary experimental trial or model of what was intended to be executed on a larger scale; for at present, not a few effects partake far too much of the petty and the peep-show. Indeed we are much more frequently and more forcibly reminded of the latter than there was any occasion for, by the ridiculously pompous names bestowed on mere closets and other confined spaces; some of which, we could almost imagine, must have been given in derision and burlesque. In regard to the collection itself, there is very little indeed in it to entitle it to any kind of distinction, if we except the Belzoni sarcophagus, and the Hogarth paintings, since the rest consists chiefly of architectural casts and very mediocre pictures; the former so huddled together as to convey quite as much the idea of a dealer's show-room, as of a museum. Neither can it be said that the collection of books is either a very choice or an extensive one. As one of works of art, it sinks into absolute nullity compared with that of the late Count Cicognara, and is, we believe, in very many publications that are to be met with, not only in the libraries of the opulent, but in those of much humbler purchasers, who, we must henceforth suppose, deserve credit for partaking of that enthusiasm and liberality which was so bountifully attributed to Sir John Soane.

Still, let the collection be what it may, the public would have reason to be grateful for it, and to bid it welcome in spite of all its imperfections, had it not pleased the "munificent donor" himself to lay a 'touch not,' 'taste not' embargo upon it, placing those, who might be disposed to avail themselves of it, in the situation of Tantalus. How stands the case? Why, after the ostentatious parade of an Act of Parliament, securing the bequest to the public, but leaving him at liberty to impose such conditions and regulations as he might afterwards think fit, he, all but nominally, rescinds it; because, as it now appears, the public are to be admitted only a few hours on twenty-four days out of the three hundred and sixty-five; or, it may sometimes happen, not even half that number, fine weather being as indispensable a passport as a ticket! So that between the caprice of Jupiter Soane and that of Jupiter Pluvius, the public are not likely to wear out their eyesight in gazing on the treasures of art which are doomed to remain incarcerated at No. 13, Lincoln's Inn Fields!

So far, then, from there being any thing of liberality or graciousness in such a gift, although we admit it to have the merit of being admirably characteristic of the giver, it can hardly be described as any thing short of over-reaching the public, first getting ready payment from them in praise and puffery, and then putting them off by a species of paltering and juggling—or, if such reading be preferred, paltry juggling,

> That keeps the word of promise to our ear,
> And breaks it to our hope.

In prospectu the donation was liberal enough: in reality, it turns out to have been dictated solely by selfish vanity, and by an ambition truly mean-spirited. Why! the griping usurer who builds and endows an almshouse, acts princely in comparison with a begrudging stinginess, which is all the more disgusting because it cloaks itself up in the garb of pompous generosity. It is no apology for Sir John to say, that as the public had no claim upon him at all, they ought to sit down contented with the very miserable pittance they have got, notwithstanding it falls so far short of what they had at one time reason to expect. We think very differently; no one, indeed, is bound to invite another to an entertainment, but having done so, he is most certainly bound not to slam the door in his face when he arrives. And whether the door of the Soanean Museum may not very fairly be said to be, if not exactly slammed in our faces, kept padlocked and barricadoed against us, we leave our readers to decide, after what has been above stated in respect to admission.

None can be more ready than ourselves to admit that the house in Lincoln's-Inn-Fields is as ill-suited for a place of public rendezvous of any kind as can well be imagined; a score of people make quite a crowd in it, and even one, supposing him to be of portly dimensions, must work his way as gingerly through the gimcrackery and its defiles, as he would through a fashionable 'squeeze.' Yet this becomes only a *raison de plus* for its being opened every day (Sundays excepted) throughout the year; and if not all day long, at least as long as daylight lasts. Instead of which the grudgingly bestowed pittance of twenty-four days must always be more or less curtailed by wet, or, it would seem, even dirty ones; for we suppose Sir John died too poor to bequeath a fund for purchasing mats and scrubbing brushes. We grant, that in case of its being so opened, it could not very well be retained as a private residence. What then? If it was to be public property, it was the convenience of the public, and that alone, which ought to have been consulted; on the other hand, if it is to be in reality private, why was it not kept so, without any 'make believe' and child's-play nonsense of bestowing it upon John Bull?—though we grant that it may with some plausibility be argued that a fictitious gift is a very suitable one for a fictitious personage, which reflection, perhaps, quieted the conscience of John Soane when he thus choused the other John. His donation is, like Dame Quickly, neither fish nor flesh—a mere 'dog-in-the-manger' affair, which gives in good earnest to no one, neither the public nor any other party. Except in words alone it no more belongs to the former, than do the galleries and collections of private individuals, who set apart days for letting them be seen by tickets, which, after all, is not considered a very portentous stretch of generosity or public spirit on their part.

Had Sir John actually been the public-spirited character some exceedingly credulous people have imagined, and some very fawning ones represented him to be, he would have consulted his object more effectually by bequeathing his collection as the nucleus of a museum of architecture that should be constantly open to the public, professional men, and students. He might thus have laid the foundation for a national establishment of the kind on a most liberal footing, and extensive scale. Even this, though a welcome and *bonâ fide* donation, deserving our gratitude, would have been no prodigy nor unparalleled example of prodigal patriotic munificence, when we call to mind the magnificent church of Possagno, erected at his own sole cost by Canova; or the Fitzwilliam bequest; or the generous, though little spoken of, liberality of the Dublin architect, Francis Johnston, who with a more princely feeling, if not with so princely a fortune as the English one, did not wait for his departure from the world, but during his lifetime reared a handsome building for that purpose, and presented it to his brother artists! But *Dis aliter visum est*, the Soane donation is a mere farce, what would vulgarly be styled *a dead take in*; and it will go down to posterity as a monument of the knight's selfishness, his caprice, his paltry vanity, his sordid pomposity, and his double-dealing, unless it should please posterity to consider him more indulgently as a well-meaning dotard.

Pro Patria.

ENORMOUS STONE REMOVED FROM THE RIVER TAY, IN PERTHSHIRE.

The improvement of the navigation of the Tay is going on under the superintendence of the Messrs. Stevensons, of Edinburgh, who, before recommending the docks being made at Perth, advised, as a preparatory work, the removal of the different fords and sandbanks which have always obstructed the navigation, as well as the formation of certain junction dykes, which, by joining several islands with the main land, thereby contracted, straightened, and deepened the principal fairway of the river. Some hundred thousand tons of matter have already been removed, and part of the excavation for the Perth harbour is also completed. Some years ago a large stone, yclept *Craig Sharpie*, was removed from the bottom of the Tay, which had frequently caused damage to the shipping. Mr. Turnbull, the resident engineer, received much credit for the success of his undertaking at the time; but he has achieved a much greater feat lately. An immense stone, long supposed to be a rock, and embedded in the fairway of the channel, about 200 yards from the Friarton, the top of it being immersed to the depth of five feet at low water, has been removed from its situation by operations continued during only five tides. From the efficiency of the means adopted, it was raised and taken ashore on the Friarton Island with comparatively little trouble, although its weight is between forty and fifty tons, and its solid contents, 12 feet 3 inches long, $7\frac{1}{2}$ feet broad, and $6\frac{1}{2}$ feet thick=598 cubic feet.

The way in which the stone was raised was by means of two dredging lighters, capable of containing 25 tons each; these were brought to the spot at low water, and a hole of two inches diameter having been previously made in each side of the stone, and plug bats having been inserted, a chain was fastened to them, and when the tide rose the stone was floated off its bed and thus conveyed ashore. The specific gravity of a similar whinstone block was formerly ascertained, from which it was found that eleven and a half cubic feet equalled a ton. Eighteen cubic feet of the gravelly matter from the bottom of the river have been found on an average to weigh a ton.

CANAL LOCK, GATE, PADDLE, OR CLOUGH.

Sir,—I beg to forward for insertion in your excellent Journal, the following facts as to the effects of two new Paddles or Cloughs, constructed on a new plan, and applied to one of the locks (Bradley Lock Upper Gates) on our canal. The lock is 76 feet long, $17\frac{1}{2}$ feet wide, the recesses for the lower gates (each) 12 feet by 9 inches, and the fall 5 feet, making 6740 cubic feet, or $46,243\frac{3}{4}$ gallons of water to each lockful.

The lower gates being closed, and the new cloughs in the upper gates drawn, the gates will open in less than one minute (54 seconds) from the commencement of drawing the cloughs. The *handling balances the clough when up.*

The clough descends (after a slight push with the hand) by *its own gravity* without any perceptible *concussion upon the lower bar of the gate*, and it is raised with ease when the lock is empty by a man at the handling, which describes a radius of 18 inches.

I forbear making any remark upon this *very simple* and *effective contrivance* at present, but at some future time I may forward to you a sketch, a drawing of one gate, with the clough, &c., annexed. Yours, &c.

Engineer's Office, Winwick Quay, November 10, 1837.

John Lister, Engineer to the Sankey Canal Company.

[We shall be obliged by having the drawing forwarded to us for insertion in our next Number.—*Ed. C. E. and A.*]

BRICK AND CEMENT BEAM.

Sir,—Observing an account in your last Number of the brick and cement beams which have been lately constructed by Mr. Brunel, and by Col. Pasley, of the Royal Engineers, for ascertaining the strength of materials and their aptness for certain novel applications, I beg to mention an extraordinary example of the kind, which stands exposed by the way-side on the road leading from Vauxhall to Battersea Fields. Passing in that neighbourhood a few days since, to ascertain the London terminus of the Southampton Railway, I found an erection on a plot of ground, which that Company has selected for the purpose of a depôt, exactly opposite the Cement Manufactury, Nine Elms, which is described by a board affixed as an "Experimental Brick Beam."

This erection is a brick wall 24 feet 6 inches long, 4 feet 9 inches high, and 2 feet thick.—Between its second and third courses from the bottom, two parallel lengths of slight iron-hoops are inlaid, the ends of which are seen projecting; in the fourth course from the bottom, the hoop-irons are again visible at each end; and above that, between courses seven and eight, there appears only a single length of the iron, in the next course after which there is none. The wall is raised six feet from the ground, each end resting on a pier of brickwork, the *length of twenty-one feet four inches clear between the piers, being without support*, under which you may walk as under a wooden beam! This I consider a surprising proof of the strength of adhesion of Roman Cement: you will observe, that more than double the length of the brickwork in the experiments mentioned by Colonel Pasley is here unsupported. But this is not all; by a chain, or some other contrivance thrown over the wall at its centre, a cradle is suspended, loaded with pig-iron, and on which is inscribed the weight it contains, viz., 10 tons 14 cwt. 1 qr. 4 lbs.

If there had been the slightest elevation of the centre of this structure forming any segment of a circle, or were there now any depression from the prodigious weight appended to it, there would be an evidence of settlement in the joints of the brickwork, or more probably of fracture in the bricks themselves; but this is not to be discerned; it is a perfectly horizontal brick beam, stretched as it were, from pier to pier, over a space of twenty-one feet, supporting nearly eleven tons on its centre.

It is not for me to point out the practical advantage that may be derived from this curious experiment; I would recommend all scientific persons, to whom it is accessible, to see it, which they may do in riding past, and I should think the application of its principle, in a vast variety of instances, must suggest itself to them. Your's, &c. A. C. E.

Essex Street, November 17, 1837.

[This beam, loaded as described, has now been standing, to our knowledge, without any appearance of fracture, for nearly two years.—Editor.]

PARISH SURVEYS.

Sir,—The vast number of surveys which are now being commenced for the Poor Assessments and Tithe Commutations, would seem to be likely to call forth, ere long, the whole body of surveyors into the field. It would behove all those who are undertaking heavy contracts, to beware that they are not losers by the lowness of the prices at which they are agreeing to take them—and parish authorities should also be careful that they intrust their surveys to competent professional men—not, for instance, to London map-sellers.

All the surveys are, when completed, to be placed under the surveillance of the tithe commissioners, or their assistants, who require every parish to be triangulated. I would remark that this triangulation, which is entirely extra to the surveying, will alone cost about two-pence per acre; when the survey is completed, the acreage is calculated, the books of reference compiled (all, moreover, in a much less space of time than ought to be allowed), and when all assistants and labourers are paid, where will the professional man find the reward for the sweat of his brow? I am far from impugning the rules which are circulated by the Tithe Commissioners, but I do think that parties, undertaking and guaranteeing surveys by contract (like bricklayers), and in ignorance of what the Commissioners require, will find themselves, at the present prices, finally much out of pocket. The vastness of many of these surveys, and the accuracy required, would seem to call forth the talents of many who have hitherto thought surveying beneath their notice, I mean the younger members of the profession of civil engineering; but it would be painful to see members of a profession of high standing, undertake business at a price which would barely remunerate a country schoolmaster.—Your's, &c. W. R.

THE DUTIES WHICH PROPERLY DEVOLVE ON THE CIVIL ENGINEER, AND ON THE ARCHITECT RESPECTIVELY.

Mr. Editor,—The object of your Journal being the advancement of science, and the improvement of the public taste, I do not hesitate in calling your attention to the importance of a just discrimination between the duties which properly devolve on the Civil Engineer, and on the Architect respectively, from a neglect of which at the present time there is great danger of the public interest being often seriously compromised; the want of judgment in the selection of professional advisers frequently manifested by Directors and Committees, shows that they cannot be aware of the great difference between the education and course of practice which distinguishes the two professions.

I am persuaded that from this circumstance many of the architectural structures, connected with the numerous rail roads now forming, instead of being in accordance with the improved taste exhibited in the architecture of the metropolis, and in most of our provincial towns, will rather resemble the buildings of an union poor house, or those surrounding the press yard of a prison, than the public works of a great and wealthy nation. Perhaps it may be argued, in extenuation of this neglect of taste, that the *minor* stations of a rail road are too insignificant to be placed under the direction of a regularly educated architect, and that they may therefore be left to the taste of a clerk in the engineer's office; but surely if the park lodge, the turnpike house, or the village inn, are susceptible of an architectural character, a rail road station cannot be less so; and in proof of this position I would, amongst many other examples which might be cited, refer to the neighbourhood of Trentham, where no traveller can fail to be struck with the taste displayed under the directing hand of the late Duke of Sutherland, in all the road side buildings on his estate.

As much of the picturesque scenery of our country, and the numerous mansions of our nobility and gentry, with which it is so thickly studded, must in a great measure be lost to the rail road traveller, any suggestions for supplying objects of interest along the line of road, cannot be undeserving the attention of those who have the direction of these undertakings.

I would merely add, that on the score of expense, it is well known to those who are conversant with such matters, that a heavy unsightly structure is frequently more costly than one which would combine beauty with utility, or picturesque effect with every requisite accommodation, I am persuaded that no engineer of eminence will hesitate in admitting that the character of the works chiefly occupying his attention disqualify him for entering into those minute details, on which architectural beauty is so dependent, and he will therefore gladly transfer this department to one whose education and habits of thought qualify him for doing it justice.

With best wishes for the success of your valuable Journal, I remain, Mr. Editor, your obedient servant,

November 18, 1837. AN OBSERVER.

SUGGESTIONS FOR A MONUMENT TO WILLIAM CAXTON.

Sir,—As a survey is now being made for the purpose of building a new line of street from Pimlico to the new Houses of Parliament, permit me to suggest the propriety of erecting a suitable monument to the memory of Mr. William Caxton. The memory of the man who first introduced the art of printing into this country, ought not, surely, to be totally neglected; and as the Almonry, where his house still stands, in which he erected his first printing press, will, no doubt, be pulled down, a most favourable opportunity is thus offered—to neglect which would be most unpardonable.

On the site of the Almonry a square, bearing his name, might be erected, in the Tudor style, surrounded by a cloister, in the centre of which his statue might be placed, and on one side a Government printing-office might be built, with a tower and spire, conspicuous above the surrounding buildings.

The style of architecture that I have ventured to suggest, being that which was practised in the age in which he flourished, would, I conceive, be most appropriate.—Your's, &c. A. J.

November 16, 1837

MR. BARDWELL'S COMMENT ON REVIEWER OF "TEMPLES, ANCIENT AND MODERN."

Sir,—Luckily for me I possess a shield against which the bird-bolts of your Reviewer fall harmless. If he had read my prospectus attentively, he would have seen that the work therein described "will comprise a digested collection of upwards of 800 notes, made for the guidance of the author in his professional practice." Your Reviewer pretends to have seen this prospectus, but why did he overlook this paragraph, which renders his tirade of abuse both unnecessary and ridiculous? Moreover, his discourtesy prevents my giving the very easy explanation of the plate of St. Mary, Woolnoth, or the reasons why the lancet-arch-style of architecture accords best with the lofty spire. But, thank heaven, his venom is innocuous—resembling an over-dose of arsenic, instead of poisoning, it sickens.

That your Reviewer should see no connexion between the illustrations and the text, is not at all surprising in one who could see no connexion between the figure of the stone-mason and the

"Oppida Publico,
Sumptu Jubentes, et Deorum,
Templa novo decorare Saxo"

of Horace.

Satisfied with the good intentions with which I published my "Notes on Church Architecture"—satisfied with having produced a work containing more information upon one particular subject at a smaller price than any work of the kind ever known—satisfied with the great and unexpected circulation the work has obtained among architects, and the unanimous declaration of those gentlemen, "that there never was a work calculated to do so much good for the profession," I take leave of your Reviewer, knowing that it was such anonymous scribblers as he, that imbittered the life of a *Chambers*, and caused the premature retirement of a *Soane* from a beloved profession which he adorned.

And now, Mr. Editor, permit me, as a well-wisher to your Journal, to caution you against admitting into your pages, without due examination, the productions of these shrouded stabbers, however low the price may be at which their effusions are offered, particularly when their opinions are the reverse of your own, as witness the contrast presented in the first and second numbers of your periodical. A "Civil Engineer and Architect's Journal" could hardly be expected, at its outset, to heap ridicule upon its supporters, from the highest to the lowest, as the respected name of *Gwilt* among the former, and that of my humble self among the latter, fully evidence.—Your's, &c.

49, Pall Mall, 4th November, 1837. WM. BARDWELL.

In courtesy to Mr. Bardwell (whom we consider a highly respectable member of the profession) we give insertion to the above letter, but we must beg it to be strictly understood, as not forming a precedent. We must suppose it

is intended rather as a piece of admonition to us, than a justification of himself. That the article was far from being favourable towards him, we admit; that the censure was in any respect unjust or unmerited, his letter does not prove; on the contrary, the only thing wherein we were mistaken, was in imagining that the work professed to be an original one, instead of a mere compilation of notes selected from different sources, which, he says, the Prospectus would have given us to understand. We can only say, that it would not have been amiss had he distinctly stated in the book that such was its plan. In our opinion, too, it would have been no more than fair both towards us and those from whom he borrowed, had he given a list of the publications he had availed himself of, with reference to the pages where passages from them occur, unless pointed out in the body of the work itself. At present, it is impossible to know exactly what he has borrowed, and what is really his own; besides, by expressly quoting one or two works, the inference is that he wished all that was not so quoted to pass for his own. With the success of the work, the high character it has already obtained among the profession, and the opinions pronounced upon it by the rest of the press—does he include that of the *Atlas?*—he assures us he is perfectly satisfied. Unless, therefore, he attaches more importance to our review than all the others put together, we do not see what he has to complain of. Most assuredly we do not see wherefore he should remonstrate with us. *If the critique in question betrays ignorance*, coupled with injustice, if it has censured when it ought to have praised, it can hardly be so formidable as to shake the high reputation it had previously acquired, it seems, among those who ought to be competent judges of its worth. It is we, rather than Mr. Bardwell, who must lose in the estimation of the public.

We thank him for the solicitude he expresses on our account, and for the caution he recommends us to adopt for the future; the plain English of which is, that in our reviews of books we ought to say nothing likely to be at all unpalatable to their authors. How this is to be reconciled with our duty to our readers, he has not informed us. We have only one other brief remark to make, which is, that Mr. Bardwell has fallen into a most ludicrous mistake when he cites Sir John Soane as a victim to ill-natured, envious criticism, saying it caused him to retire *prematurely* from his professional career!!!—*Editor*.

COMPETITION ESTIMATES.

The following remarks upon the system of competition estimates, for works about to be performed, are rather hurriedly thrown out; but thinking the system is bad under any circumstances, I do not like to delay giving vent to my ideas, although having other engagements, than by committing those ideas to writing. I must be excused if I do not enter quite so fully into the subject as I know many would wish. There are several different modes of competition: the worst and most unfair is the common way of advertising, the plans and specifications to be seen generally at the Architect's or Surveyor's Office, when parties must be at great trouble, if not expense, to take out the quantities, &c. I have known nearly one hundred pounds expended in this way, and the job lost after all. Another most unfair method is advertising as before, and when parties apply to take out the quantities, &c., they are informed they will have them furnished on payment of a certain sum, thus taking perhaps fifty pounds from the tradesmen, when the sum charged to one would have been ample; this plan was adopted to some purpose (!) (report says to the tune of thousands) by an ingenious young Architect,* during the time workhouse building was at its height, a number of which he contrived to have a finger in. Another and certainly much less objectionable plan is, writing to several tradesmen, and then for them to appoint some person (generally a respectable Surveyor) to take out the quantities for the whole, the parties carrying out their own prices, and the winning party paying the person who took out the quantities, thus bearing the losers free of expense. Again, a still better method is for the Surveyor himself to furnish the quantities to all, of course the winner still paying for them; in the two last methods, the charge for quantities should be furnished with them. Another, and in my opinion the best method, is that in which different descriptions of work given, and a price per foot, yard, rod, or whatever it may be, is required, the work when done being measured and charged at those prices; but even this is objectionable, as I shall endeavour to prove. It is very common with many people to say, "give a good price, and you will get a good article;" with nothing does this saying hold good more than building; you may have cheap houses, as well as other things, but that is no reason why they should stand the test of cheapness—durability.

The system of having works competed for by various parties, can have in the end but one effect, namely, that the works, of whatever description, are not done in that "sound, workmanlike manner" that they would have been, had but one party been applied to for an estimate, or had the work been done by measure and value, which, in my humble opinion, is the only correct method. It is a well-known fact in the trade (I mean building), that contract work is never done any better than can be helped, if I may be allowed the expression, as all that the Contractor cares for, is to obtain the Surveyor's certificate of the work being completed. After gaining the contract, the whole object is to get the work done, no matter how, and as cheaply as possible: thus inferior workmen (so they can but get over a good deal) and materials are very often employed, notwithstanding the vigilance of a Clerk of the Works, Surveyor, or whoever may have the superintendence of the work. I am fully aware of the serious charge I am now making, and that the answer will, in all probability be, that no respectable builder will do such things. Those who say this, should think of the saying, "[illegible] is roguery in all trades but ours;" and let them inquire amongst working men, and the answer will be, that as long as the work is done, it is of no consequence how, so that it will but pass. I am aware, also, that in ninety-nine cases in every hundred, no directions to this effect are given by the Contractor; but why is this? simply because it is perfectly understood by working men, that contract work is not expected to be finished in that "sound, workmanlike manner," that other work is, at least not by the Contractor. If I were requested to prove these assertions, by reference to works already done, I fancy most who read this would be able to point to some public or other building, whose tottering state would fully bear me out. Indeed, while writing this, several seem to arise to my memory; but as it would be invidious to name them, and might lead to much discussion, I shall refrain. What is the general excuse made, when any one remarks that there is a great deal of settlement in such a building (naming one), or that the joints of the flooring or other wood work open very much, that the plastering blisters, and the enrichments are not well relieved; or, in fact, whatever fault you find with the work, what, I repeat, is the excuse made? *"Oh, it is only contract work."* Yes, "only contract work;" and yet, in the face of this, contract work is on the increase; indeed I may say that nothing is now done without competition. It is but about a month ago that three different parties were written to respecting a slight repair, that did not amount to a sovereign altogether: this was perfectly ridiculous, but not less true on that account. I shall not enlarge further upon this subject at present, for the reasons before stated, hoping what I have remarked will lead some one more able, though not more convinced of its evils, to endeavour to effect the disuse of the system. Much more might be said, something perhaps in its favour, but let many, very many insecure buildings and ruined tradesmen speak for themselves. Allow me to add, that it is a system that leads to much dissimulation and bad feeling, engenders envy, hatred, malice, and all uncharitableness.

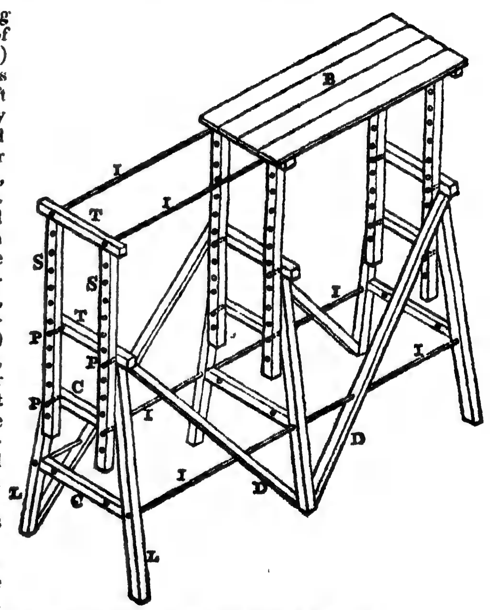
November 20, 1837. J. J.

* If such an occurrence did take place, it is one of the most disgraceful acts that any man could be guilty of. If true, we should be glad to receive the particulars, that the party may be held up to the scorn of the respectable portion of the Profession, who, we are sure, will join with us in condemning such a system of robbery —EDITOR.

BIELEFELD'S PORTABLE SCAFFOLD.

THIS Scaffolding consists of a series of frames or horses (L L) upon which others (S S) are made to shift up and down to any required height, and secured to the lower frames by iron pins, with nuts and screws.

The upper and lower frames are each 10 feet high, the scantlings of the timbers 3½ inches by 3, and connected together by iron rods (I I) one inch diameter, having a shoulder on one side, and nut and screw on the other, and kept upright by diagonal braces (D D), as shown in drawing.



The upper frames are 3 feet wide, with top-rails 4 feet long. The lower frames are 3 feet wide at the top, and spread to 6 feet wide at the bottom, with top-rails 4 feet long.

The posts of the upper frame (S S) are strengthened on each side by plates of iron, an eighth of an inch thick, and perforated with holes for the pins to pass through, about 9 inches apart. The other timbers have an iron plate on one side only (excepting the diagonal pieces).

The board (B) can be placed at any height, either on the top-rails (T T) or cross-rails (C C), so that two or three stages can be formed at one time upon the same scaffolding. The whole is made to take to pieces, the several posts and cross-rails being morticed together, and secured by nut and screw-bolts. It is evident that any number of these frames can be made to form a scaffolding of any extent, and where only a low scaffolding is required, the upper frames can be used, as well as the lower, for the same purpose. The whole can be put up or taken down with the greatest facility.

The above was invented by Mr. Bielefeld, for the purpose of fixing his *Papier Machée* ornaments upon the walls and ceilings of large rooms; and he is now preparing one, of some extent, for the works he is executing for the long galleries of the British Museum.

We recommend the use of this scaffolding, not only for its portability and facility of fixing, but for the greater security against those accidents that so frequently, and, lately, so fatally, occur to scaffolding of the common description. Among other advantages are its neatness of appearance, and economy of room in construction, which in finishing interiors is very desirable.

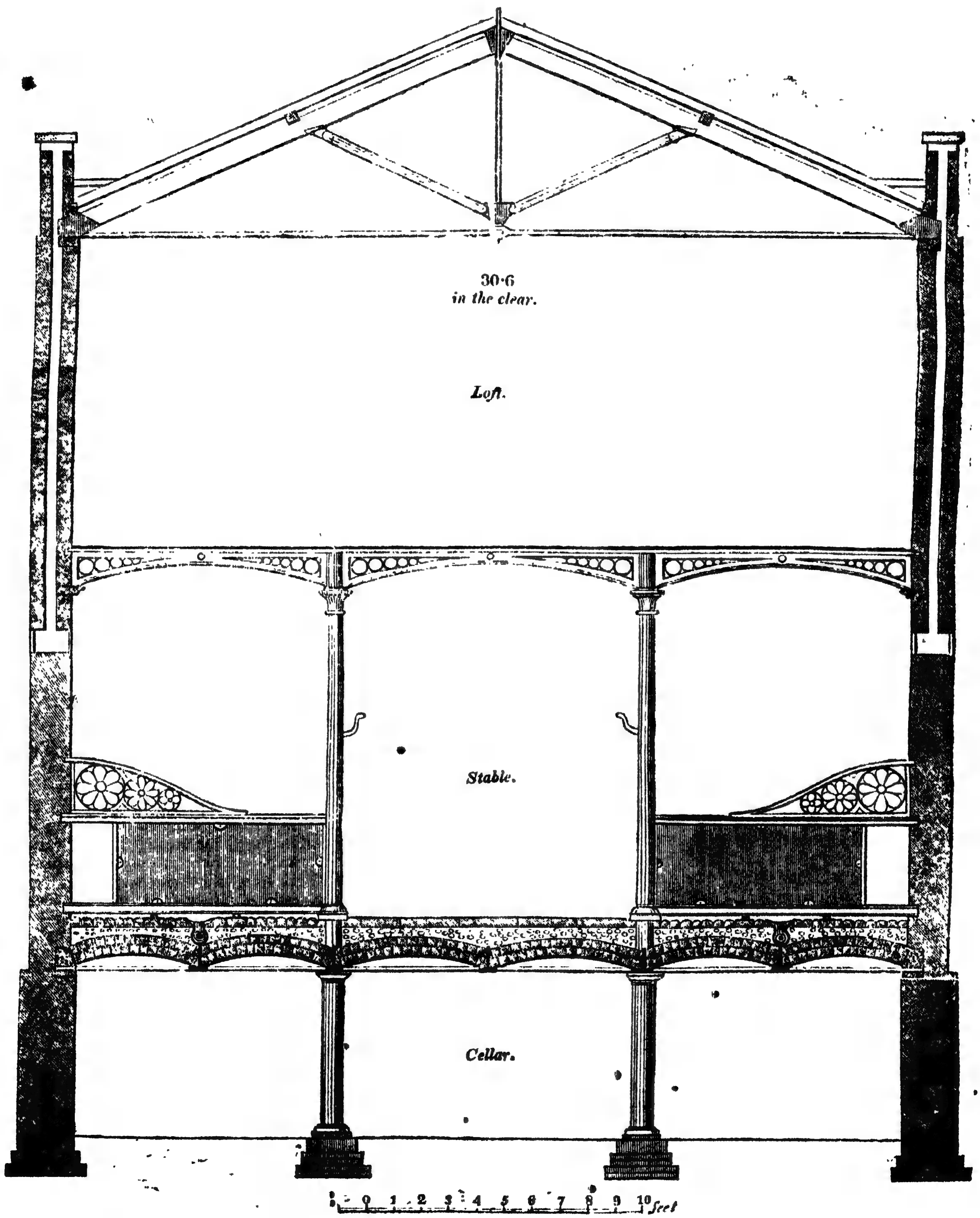
THE NEW STABLING

AT MESSRS. TRUMAN, HANBURY, BUXTON, AND CO'S BREWERY, BRICK LANE, SPITALFIELDS.

CONSTRUCTED AND ERECTED UNDER THE IMMEDIATE DIRECTION OF R. DAVISON, ASSOCIATE MEMBER OF THE INSTITUTION OF CIVIL ENGINEERS.

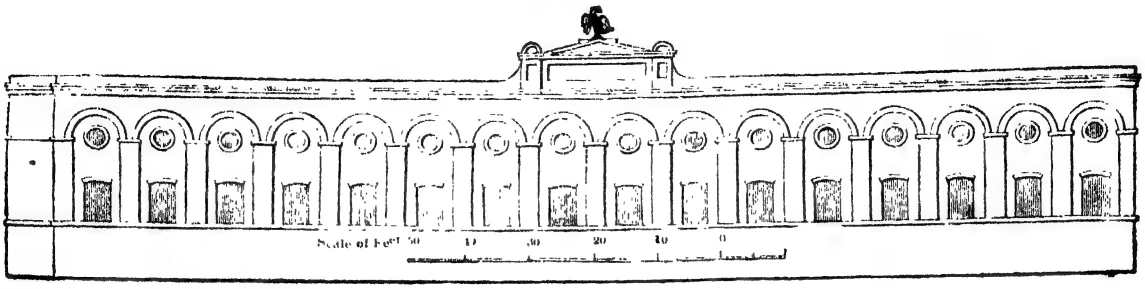
These stables are considered to be the most complete of any establishment in London, no expense being spared to render them both convenient and suitable for the purposes intended; considerable judgment and ingenuity has been displayed throughout the building, particularly in the construction. The architecture of the elevation is remarkably well designed for the purposes of the building; it is plain, well proportioned, and free from frivolity. The design presents a plain basement surmounted by pilasters, from which spring continuous archivolts; throughout the whole length is a bold cornice with a panelled attic over the centre, with a pediment and an eagle towering on the apex. The space between the pilaster or piers are occupied with windows; the upper ones are circular, with architraves, which gives the whole design a very neat finish.

SECTION OF ONE OF THE STABLES.

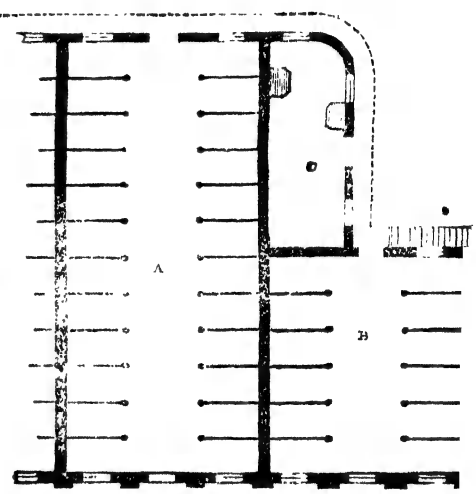


Scale of feet.

ELEVATION OF FRONT.



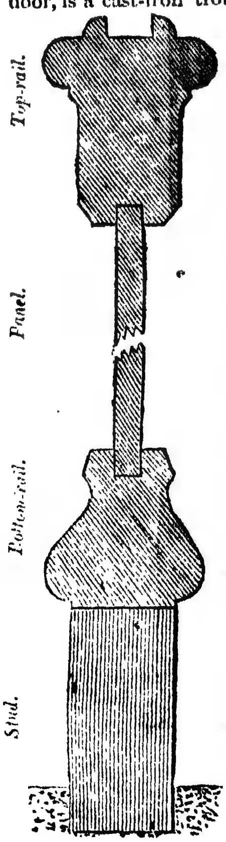
DESCRIPTION OF THE BUILDING.



The general arrangement comprises four stables, each 69ft. long and 30ft. wide; one of them is shown in the plan annexed, marked A. At one end is an additional stable (B), containing twelve stalls and a farrier's shop (C); at the other end is the infirmary, containing six boxes, making a total accommodation for 114 horses.

The general construction is shown in the section; each stable is fitted up with stalls 5 feet 9 inches wide from centre to ce e, and divided by iron partitions, as shown at large by the annexed drawing.

The frame is of cast-iron, with an ornamental head-piece, and the panel of wrought-iron a quarter of an inch thick, fitted in the groove cast in the frame, as shown in the annexed cut which is drawn one-fourth the full size; the heel-posts are of cast-iron, fluted, and have a very neat appearance; every other post is the whole height of the stabling, and carries the floor above: each post is furnished with two hooks to hang the harness on. At the head of the stall is a cast-iron manger, 3 feet 8 inches long, 14 inches wide on the top, and 12 inches deep, supported on a cast-iron bracket, which is secured through the wall as shown in the section. Above the manger the wall is lined with half-inch slate slabs as high as the top of the ornamental head-piece, and above is a cast-iron tablet, containing the horse's name; in the centre of each stall is a grating communicating with a cast-iron drain or pipe, as shown in the section, running the whole length of the stabling; through this pipe a stream of water is allowed to run for a few minutes every morning to thoroughly cleanse it. At the end of each stable, opposite the door, is a cast-iron trough, with pipes and cocks for supplying hot and cold water. The stables are ventilated both below and above by several air-bricks, as well as by eight flues in each stable, which ar carried up in the party walls, having moveable ventilators to regulate the egress of foul air; in addition to these, th windows (of which there are six in each stable) have the centre part to move with a lever, in the same way tha louvre boards used in breweries usually work, by which means a space equal to 40 square feet in each stable can b thrown open to the atmosphere, or closed as may be found necessary.



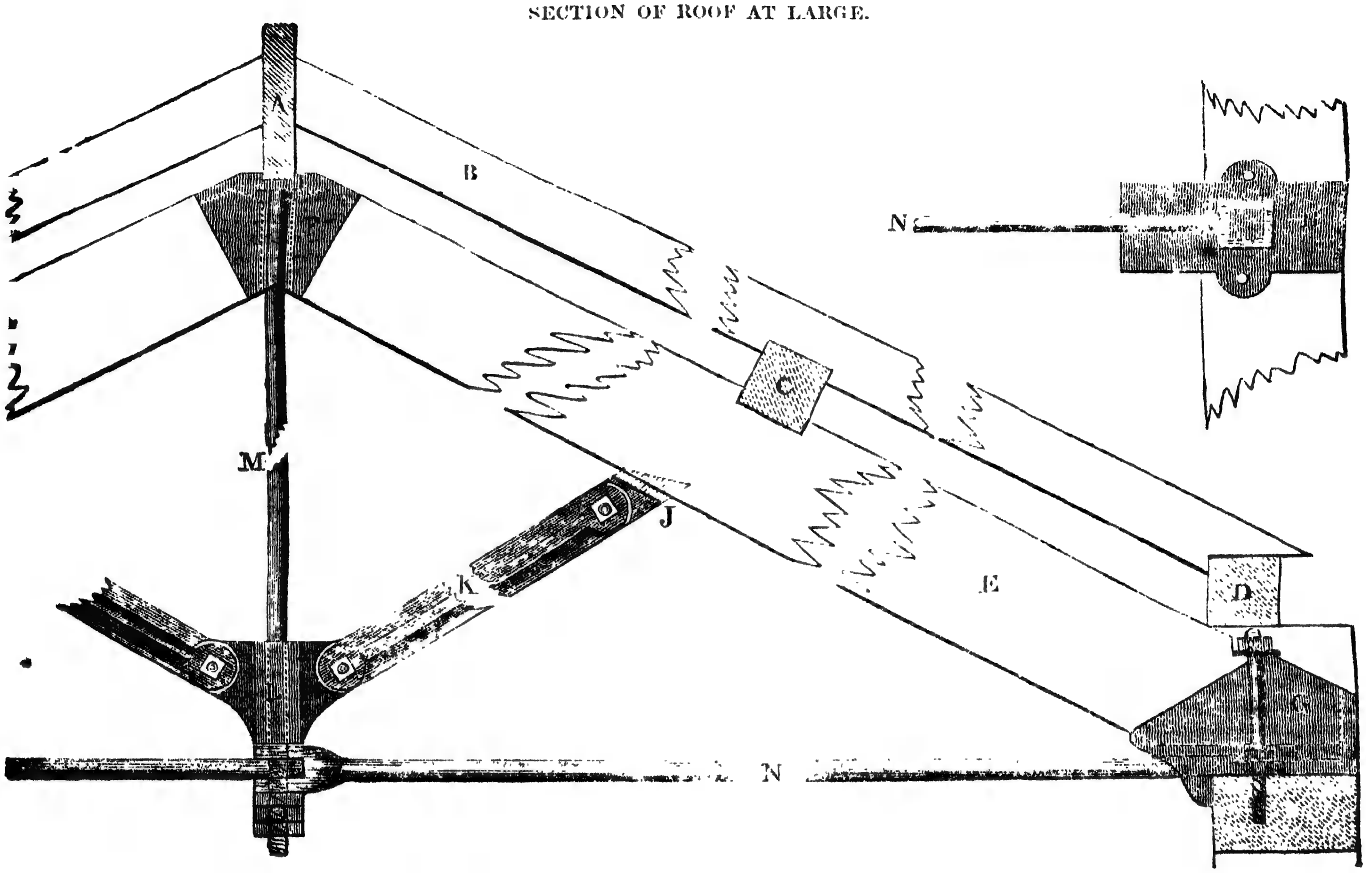
The middle part of each stable (that is to say, between the heel-posts) is paved with 5-inch Aberdeen granite, laid i regular courses, length-ways with stable, each course being 2 feet 2 inches wide, and having grooves or chases cut acros them 6 inches apart; when laid, the whole has the appearance of so ma. y parallel lines. Between the iron divisions paved with pebbles, averaging about 4 inches square at top.

The floor on which the paving is laid is constructed thus:—Upon iron columns, immediately below those which forn the intermediate heel-posts of stable-rest iron girders, with joists joggled into them, as will be seen by referring t drawing, skew-backs are formed on the flanges of the latter, and two rings of 4-inch brickwork, in cement, sprin from them; the spandrells are afterwards filled in with refuse bricks mixed up with grout, upon which is laid sufficier dry rubbish to bring the paving to the level required. The space below the entire range of stabling is occupied as al store-cellars, the casks being conveyed through an iron tunnel across the street, by an ingenious contrivance, which w intend to give a sketch of at some future opp rtunity. The floor of cellars is concrete, composed thus: dry lime, on part; Thames sand, one ditto; clay, burnt, 3 ditto; gravel, 5 ditto, mixed with boiling water.

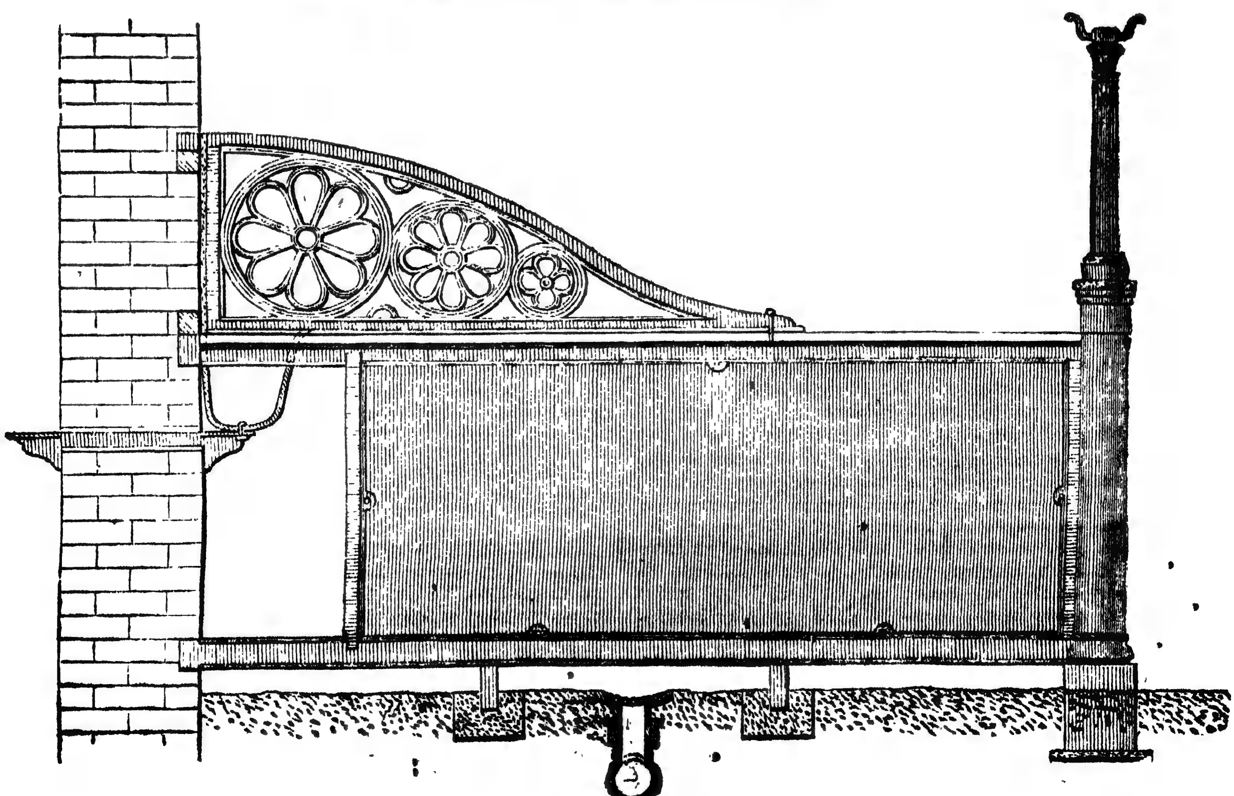
Over the stabling are the lofts. The floors are of cast-iron plates, half an inch thick and 33 inches square; th top is made rough by concentric grooves being cast on the face; these plates are laid on cast-iron joists, framed int longitudinal bearers or girders, resting on the top of the heel-posts, as shown in the section. The floor, both from th underside and over, has a very neat and light appearance, and renders each stable perfectly fire-proof. The roof over th lofts is deserving of notice; it is judiciously framed of cast-iron and timber, as shown in the section, and the parts mor at large in the annexed figures.

A ridge of fir, 10 × 1½ inches: B common rafter 4 × 3 inches, placed 13 inches apart: C purlin, 5 × 5 inches: D pol plate, resting on block, spiked on the foot of the principal: E principal rafter, 9 × 5 inches at bottom, and 8 × 5 inche at top, which abut against and let into the cast-iron king-head F; the foot of the principal is let into and abuts on a cast-iron shoe, G, and screwed by a screw-bolt, which passes through an eye made in the end of the tie-bar, and is thus secured and prevents the rafters spreading at the foot. This shoe is cast with cheeks, and a plate on the underside; it is fastened on to the wall plate, H, by two screw-bolts; the underside of the shoe is shown in the side figure, and the manner the iron tie is secured: J cast-iron abutment plate to the strut, upon which the principal rests: K cast-iron strut, with feathers on each side to strengthen it; each end is fixed in a circular joint by nut and screw-bolt: L cast-iron abutment, with a pipe or hole in the centre for the king-bolt to pass through: M king-bolt of wrought-iron, 1¼ incl diameter, with a large head, which rests on the top of the king-head; the bolt passes through the head and lower abutment joints and a shackle joint in the centre of the tie-bar; the lower part of the king-bolt is tapped with a screw and nut, which firmly screws up the whole of the roof: N is a round wrought-iron tie-bar, 1⅝ diameter, with a shackle joint in the centre, and square eyes at each end, which are secured to the wall-plates as before described.

SECTION OF ROOF AT LARGE.



ELEVATION OF PARTITION BETWEEN THE STALLS.



Scale half an inch to one foot.

WEIGHT OF IRON-WORK TO ROOF.

		lbs.
Cast-iron king-head F		45
Do.	Abutment joint L	23½
Do.	Shoe G, each 61*lbs.*, the two	122
Do.	Plate J, each 13*lbs.* the two	26
Do.	Strut K, each 103*lbs.*, the two	206
	Total weight of cast-iron	422½
Wrought iron King-bolt M		30
Do.	Tie bar N	160
Do.	Bolts, nuts, and screws	11
	Total weight of wrought iron	201

STABLE FITTING.

	lbs.	Cwt.	Qr.	lb.
Cast-iron top rail of partition	260			
Do. bottom rail	300			
Do. back rail	40			
Do. ornamental head piece	150			
Do. heel-post and standard	282			
Total weight of cast iron	1032	9	0	24
Wrought iron panel		2	1	5
Cast-iron manger	224			
Brackets to carry two mangers on each side of party wall, 39*lbs.* say half	19½			
	243½	2	0	19
Total weight of iron-work to each stall		13	2	28

The circular or bull's-eye lights to the lofts, as shown in the elevation are of cast-iron, including the architrave, and are 36 inches in diameter in clear of frame, and weigh 218*lbs.*; cost £1 each. The lower windows to stables are of cast-iron, 6 feet 9 inches by 4 feet 6 inches, and weigh about 2 cwt. each.

Along the whole length of the back front, on a level with the loft floor, and communicating with each loft, is a balcony or gallery; the bottom is of inch slate slabs, and projects before the wall 33 inches, supported on cast-iron cantilevers let into the wall 5 feet 6 inches apart.

At one end of the building is placed a four-horse condensing steam-engine, for the combined purposes of cutting chaff, raising fodder into the loft, and pumping water from a well in the cellar for the use of the stable and other purposes.

The total weight of iron (wrought and cast) used in the building, is about 300 tons, the cost of which did not exceed £10 per ton, including all labour, fitting, and fixing!

The entire cost of the whole range of building, including vaults, lofts, &c., amounted to nearly £10,000, and was built and finished within six months after the commencement.

The great advantage attending the construction of these stables are—less chance of disease among the horses—prevention of splinters of wood injuring the horses—more durable than any other material—first outlay very little more (if any) than fittings of oak—and security against fire.

We visited these stables when they were finished, and also within the last few days, and found all the iron fittings of the stabling, notwithstanding the rough usage they are subject to by the dray-horses, in as good state and condition as when they were first erected; they are an ornament to the Brewery, and are an example of good taste and judgment, clearly showing, however humble the intention of the building may be, there is room for the engineer or architect to devote his thoughts and talents.

Mr. Davison is justly entitled to the highest praise for the judicious arrangement, the ingenuity displayed in the construction, and the taste exhibited in the architectural character of the whole building.

LONDON AND BRIGHTON RAILWAY.

We make the following extracts from a report lately issued by Mr. Stephenson to the shareholders of "Stephenson's Brighton Railway, or the Western Line," which may be considered as a comment or reply to Captain Alderson's report to the House of Commons, on the several lines of Railway, between London and Brighton.—We have purposely abstained from making any remarks, as we wish, first, to see the promised report of the engineers of the "Direct Line," which we understand will be ready in the course of a few days; we hope it will be issued in time for us to notice it in our next number.

"Captain Alderson commences his report by stating, that having examined minutely the various plans, and carefully the evidence, and inspected the country generally, he has no hesitation in asserting, that, in an engineering point of view, the Western Line, that is, the line proposed by me, is preferable to any other.

"Having made this declaration, he observes, that as this is only one point of consideration in a main line of railway, he will proceed to consider the respective merits severally of all the lines, in reference to the second resolution of the House of Commons.

"It must be concluded from these remarks, that, in reference to the first or leading instruction of the House of Commons, touching that line of railway to Brighton which is preferable in an engineering point of view, the military engineer decides in my favour—and it remains with me to enquire on what ground he has subsequently been led to give a preference to another line, by reference to the second instruction of the House of Commons, which directed his attention to the other sea-ports on the south coast.

"Captain Alderson opens this subject by observing, 'that the towns in the intermediate district between London and Brighton, and those on the coast, are of minor importance compared with Brighton;' as far as relates to the minor importance of Shoreham and Newhaven, as compared with Brighton, I agree entirely with Captain Alderson; but in regard to those places which have not entered into his consideration, and which, in obedience to the second instruction of the House of Commons, should, I believe, have been prominent objects of comparison, I entertain a widely different opinion; Worthing, for instance, is a place of considerable importance. The towns of Arundel, Little Hampton, Bognor, Chichester, and Portsmouth, all ports on the southern coast, are surely worthy of some attention. Portsmouth especially, being a maritime station, in every point of view must vie in importance with, if it do not outweigh in national consideration, the leading town of Brighton itself; and though the better accommodation of these places might have formed some excuse for the abandonment of the best engineering line, it seems to me that there is no such excuse for it, upon the ground of better accommodating places, which he considers to be of such minor importance. The fact, however, is, that the Western Line will better accommodate all these important places, will better accommodate Shoreham; and will equally well accommodate Lewes and Newhaven.

"As to the assertion, that there are no intermediate towns of consequence to be accommodated by the several lines, I am again obliged to differ in opinion from Captain Alderson; Epsom, with its celebrated races—Dorking, with the beauty of its adjacent scenery—Horsham, with its considerable corn market, are all places worthy of attention. Epsom alone, in one week, attracts from 300,000 to 400,000 visitors, and to these the Western Line alone offers accommodation; and it is not to be lost sight of, that it is of advantage for a railway to lead through an interesting and picturesque country which is likely to fix the attention of new residents, and thus to create an increasing and profitable transit of passengers. This seems to have escaped the notice of the military engineer, although it is a point greatly in favour of the Western Line, that it does pass through a conspicuously beautiful district; whilst the Direct Line from Croydon to Brighton, does not touch a single town throughout its whole course, and the country through which it passes is generally sterile, uninviting, and little likely to be chosen as the site of new residences. The assertion of Captain Alderson, 'that there are no intermediate towns to be accommodated by the respective lines,' applies, indeed, in full force, to the Direct Line; but not to all the respective lines. Had he considered more at large the interests of the proprietors, whose capital was to form the line, these various considerations must have forced themselves upon his attention—they have always weighed with me; they did so when I came to a conclusion, that unless you could carry the Western Line, it would be scarcely prudent to attempt any other, and of this opinion I still remain." * * *

"According to Captain Alderson, the Western Line is fittest to be adopted, from the superior facilities of its execution, but the termini of the Direct Line are superior, and therefore, that it ought to be adopted.

"The report then proceeds to comment upon the London termini of the respective lines, and the engineer, for the purpose of comparing them, adopts the northern end of Blackfriars Bridge as the centre of population. I think Captain Alderson would find, upon more mature reflection, that his adopted centre would be rather eccentric. However, let us for a moment assume this centre, and see how he deals with it. He informs us that the Greenwich Railway terminus lies within a circle of a mile radius; this information is of little use to those who wish to know how they are to reach these places by the ordinary thoroughfares. To such it may be acceptable to know that the distance from the Greenwich Railway terminus to the centre, is 1½ mile through crowded streets, where an average speed of 4 miles an hour can seldom be exceeded; whereas the distance from the same point, to the Vauxhall terminus, is 2½ miles; which, as the intermediate thoroughfares are wide, and out of the great throng of business, might be easily traversed at a speed of 8 miles an hour, and therefore this latter terminus could be reached generally in considerably less time than the former.

"Captain Alderson, nevertheless, appears to think, that plans and estimates having been formed for the lateral enlargement of the Greenwich Railway, very little remains to be done to fit it for the prompt reception of the traffic of the main southern trunk-line of railway; and he proceeds to report accordingly, omitting all mention of the fact, that the Greenwich Railway Company possesses no area for an enlarged depot, and that the small space in the possession of the Croydon Railway Company is not at all adequate in area, nor adapted in position, for the purpose, being on the opposite side of the Greenwich Railway to that which the Brighton traffic must use.

"Now this is, in my opinion, of the last importance, for it is but of little avail to attain a central terminus, unless its possession be also adapted to the formation of a depot; all who are acquainted with the nature of the property in the vicinity of the Greenwich Railway, must be aware of the enormous outlay which will be required to purchase every acre of land requisite for this purpose. If this, I may say, almost vital question in the consideration of a main line of railway had occurred to Captain Alderson, my belief is, that he would have looked any where rather than to the Green-

wich Railway for a terminus to the main southern trunk-line of Railway; if the course of Captain Alderson's investigation had led him to enquire into the facilities of the Southampton Railway, he would have learned the fact, that no additional widening would be required for the five and a half miles of this Railway, which the Brighton traffic was intended to traverse, had the Western Line been adopted, as the trains would necessarily pass on this line, at longer intervals than on the Greenwich Railway; and further, that the Southampton Railway Company possesses an area of six or seven acres for the formation of depots, with access to the river, and that this space, if found insufficient for the Brighton traffic, could be extended at a reasonable cost, the neighbourhood being comparatively open and free from buildings. He might also have learned that plans and estimates were already framed for extending, if necessary, the Southampton Railway to the neighbourhood of Waterloo Bridge.

"Had Captain Alderson known these facts, or knowing them, had he considered them, he would perhaps have placed the question of the London termini in the following point of view:—The Greenwich Railway requires widening; the Southampton elongating; the Greenwich Railway cannot receive further traffic, without an immense outlay to obtain space for a suitable depot; the Southampton has already an area of six or seven acres, which will probably be sufficient, but if not, it can be enlarged at a trifling expense. After widening the Greenwich Railway, and expending a large sum for the purpose of obtaining a depot, it would be inconveniently situated in a crowded neighbourhood; whereas, by elongating the Southampton Railway, a station would be obtained at Waterloo Bridge, probably the best position in all London; such extension affording besides the additional advantage of a third depot at, or near to, Westminster Bridge." * *

"We come next to his observations on the Brighton termini of the several lines laid before him. He begins by informing us, that the terminus of the Western Line is inconvenient for passengers from London, and for goods coming from Shoreham, as not being central. He then goes on to say, that the Direct Line has two depots, one for passengers at Church-street, 35 feet above the ground, and communicating with Church-street by an inclined plane, and another for goods at Trafalgar-street; and he observes, that the Church-street depot is the most central. Here there is an inaccuracy, for if Captain Alderson had taken his information from the printed evidence, he would have ascertained that the inclined plane from the Church-street depôt communicates with North-street, and not with Church-street; and the report omits to inform us that this inclined plane is 200 yards long, rising 1 in 5¼, being, in fact, steeper than Holborn hill. Now it must be observed that the Church-street depot is intended only for passengers; the depot for the goods is not here, but in Trafalgar-square, 500 yards farther back, or altogether 700 yards from the foot of the incline in North-street; and the terminus of the Western Line is at a distance of 800 yards from the same place, the approach to which, for the purposes of ordinary travelling, *is on a level.*

In the second place, the distance by railway from Shoreham, to these respective depots is 6¼ miles, to that of the Direct Line; and 5¼ miles to that of the Western Line—the gradients being 20 feet per mile on the Direct Line, and 16 feet on the Western Line; consequently, by the Western Line, besides a better gradient, there is a saving of 1 mile in the distance from Shoreham. * *

"Captain Alderson states it as his opinion, that the slopes in the cuttings in chalk of one-sixth to one, are dangerous; and that slopes of one to one must be substituted for them; this alteration alone increases the excavation of the Direct Line by 4,500,000 cubic yards (a quantity nearly equal to the whole of the excavations on the Grand Junction Railway, *though* 77 miles in length); which, with the consequent extension of the bridges, and greater quantity of land to be purchased, would add at least 250,000*l.* to the estimate; an excess to be counterbalanced only in a small degree, and that by no other means, than by the very objectionable plan of lengthening the tunnels. * * *

"From the result of my inquiries, I have not a doubt that water exists in all the great works of the Direct Line, viz., at the Merstham, Clayton, and Balcombe summits, and at certain seasons of the year in great quantities. The presence of superabundant water has the effect of preventing, at intervals, the prosecution of the works; for where the natural drainage is insufficient to let it flow freely off, artificial means must be resorted to; the construction and working of which necessarily add enormously to the expense of the works. Moreover, as these excavations are mostly confined in narrow valleys, the difficulties attending any artificial means of freeing the works from water would be, consequently, much aggravated. The following table, containing the particulars of the three great works on the Direct Line, the greatest cutting on the Western Line, and the heaviest excavation on the London and Birmingham Railway, which is a chalk cutting at the Tring summit, will give some idea of the comparative nature of these works.

Name of Railway.	Name of Excavation.	Length.	Greatest Depth.	Contents.	Tunnelling.
		miles.	feet.	cubic yards.	yards.
Direct Line......	Clayton......	2¼	76	1,450,000	1700
	Balcombe	1¼	70	500,000	880
	Merstham	2¾	90	2,750,000	1320
Western Line......	Capel........	$1\frac{1}{10}$	57	700,000	none
London and Birmingham......	Tring........	2½	57	1,250,000	none

"We thus perceive, that the Clayton cutting exceeds the Tring both in contents and depths, with the addition of a tunnel of 1700 yards long; next, that the Balcombe cutting exceeds the Tring in depth, but is less in contents, there being however a tunnel of half a mile in length on a curve of a mile radius, which is a fact rather strangely omitted in the report; lastly, we find that the Merstham exceeds the Tring cutting both in depth and length, being more than double its contents, with the further addition of a tunnel of three-quarters of a mile in length, and is four times the extent of the largest cutting in the Western Line, besides the above tunnel.

"The three cuttings, the Clayton, Balcombe, and Merstham, are all of them situated at the bottom of narrow valleys, where water will beyond a doubt be found, there is consequently nothing to justify the opinion, that they are to be done in less time, and at a less cost, than the Tring cutting; which is, as I before said, in an open country, with lower levels to assist its drainage. To examine this further, the united length of these cuttings does not exceed 8¼ miles, yet in this small space there are 4,700,000 cubic yards of excavation, and 2¼ miles of tunnelling; comprising an amount of excavation exceeding one-third of the whole on the London and Birmingham Railway, and nearly equal to the total quantity executed on the Grand Junction Railway, between Birmingham and Liverpool; and lastly, being actually equal to three-quarters of the total estimated excavations on the Western Line, whilst the amount of tunnelling is one-half of the whole on the London and Birmingham Line, and nearly four times the amount of the Western Line.

"Having mentioned the stupendous projected works on the Direct Line, and compared them with one of the heaviest excavations executed in this country, I leave it to others to determine whether the Report conveys any idea of their real importance, magnitude, and difficulty of execution, and to judge of the probability of their ever being completed within a period, and at a cost consistent either with the evidence given in their favour, or with the selection which Captain Alderson has made. I also leave others to decide whether the opinion of Captain Alderson, of the advantages of approaching Brighton prior to Shoreham, justifies works of this unparalleled extent.

"Captain Alderson's brief description of the embankments on this line, conveys impressions which, to me, appear little consistent with their real character.

"It is stated, 'that the embankments, on the whole, are less than the excavations;' and, 'that there are many short deep valleys to be crossed by embankments.' Let us examine these statements.

"From the 9¼ to the 21st mile of the Parliamentary Section, that is, in a length of 11½ miles, there are 9½ miles of embankments. Surely the description of short valleys does not apply to this part of the line, although the epithet of deep is appropriate enough, for the embankments are in places 50 feet high. Between the Balcombe and Clayton summits, a distance of 12 miles, there are several very heavy embankments, varying from 1 to 1½ miles in length, and from 60 to 80 feet in depth. That these valleys are deep, is certainly quite true; but what can justify the designation of *short*, as applied to them! By Mr. Rastrick's estimate, the united amount of these embankments is 2,439,000 cubic yards; a quantity, in the space of 12 miles, never yet attempted on any railway, or even seriously proposed, except in the present instance.

"Captain Alderson is quite correct in saying 'the embankments are badly disposed, and would consequently require much side cutting;' and if he had consulted Mr. Rastrick's evidence, he would have found that none, or a very small quantity, at most, is provided for; and he would have found in this another proof of the insufficiency of the estimate.

"On the other hand, on the Western Line, the *gross amount of embankments* is more equally distributed over a longer line, and thus has many more facilities for execution: the total length of embankments, exceeding 40 feet in height, is 3,100 yards on the Direct Line; but on the Western Line it does not amount to 500 yards. These important facts are, however, all unnoticed in the Report." * * *

"I have now alluded to the several points in Captain Alderson's Report. I do not complain of any opinions which Captain Alderson has formed upon sufficient and accurate data, though they may be at variance with an extensive practice, but I will briefly recapitulate the principal inaccuracies and omissions by which he has supported his selection:—

"*First*.—By a perversion of the instruction of the House of Commons he sets aside the best engineering plan, and sacrifices the interests of Worthing, Portsmouth, and other places on the southern coast, for the mere purpose of preserving the monopoly of the town of Brighton, and with that view objects to Shoreham, the present port of Brighton, being accommodated on a main-line of railway to Brighton; substituting, however, an expensive branch to Shoreham, with the ruinous branches to Lewes and Newhaven, none of which are available for any other object.

"*Secondly*.—He supports his decision of the superiority of the termini of the Direct Line by an incorrect estimate of distance from the centres to the respective depots, and after recommending works of great cost on the Greenwich Railway to meet its admitted defects, he omits to add this additional cost to the estimate of the Direct Line, neglecting to state the important advantages which would accrue to the Western Line from a much smaller outlay; nor has he alluded to the nature of the property in the vicinity of London Bridge, offering as it does an all but insurmountable barrier to the obtaining any depôt on that spot.

"*Thirdly*.—To support his selection of the Direct Line, he has adapted tables which contain principles in direct variance to those adopted as the basis of a report to the Legislature in April last, and to test the facility of execu-

tion of the respective lines, has quoted estimates which he admits to be inadequate; and,

" *Lastly*—He has altogether omitted to notice the inclined plane of $2\frac{3}{10}$ miles on the Croydon Line, the objections to which are established alike by the concurrent opinions of all engineers, and by the result of all experience.

" I have very reluctantly revived this subject; but it has appeared to me to have been forced upon me by the circumstances of the case; and when it is considered that all these errors, omissions, and fallacies in Captain Alderson's Report, are invariably in favour of the Direct Line, and against the Western Line, I trust that it will be considered that I am doing nothing more than is necessary in vindication of my professional character."

AMERICA.

We have been favoured by Mr. Weale with the following extract of a letter he has just received from Ithal Town, Esq., Architect:—

New York, Nov. 3, 1837.

MY DEAR SIR,—After waiting some months, in hopes I might have something better to write to you, in regard to the business and situation of our country, I regret to state, that very little improvement has yet taken place, and our wisest men are doubtful whether a much better state of things can occur sooner than next spring or summer. We have had a fine *crop year*, and a season free from sickness, of a contagious kind, except New Orleans, and some smaller places near it. I have finished my house, and have been living in it since June: the room for my library is a very good one, 45 feet long and 23 feet wide, and of the same height as width, with two sky-lights. My books are in it, but not yet in the book-cases intended for them. My study, a room 17 by 16 feet, adjacent to the library, is fitted up very comfortably with all necessary cases, and for the accommodation of many of the best books, engravings, paintings, and other works of art. My great western bridge is still suspended in its progress, and cannot again progress until better times. It gives me great uneasiness to have such a work suspended, and the loss of time and money will be very severe upon all concerned; still it is fortunate that we had not proceeded farther in the expenditure than we *had* when it was stopped, viz., about 230,000 dollars. * * I shall soon have a wood-engraving of my house made, and will send you a view of it. I will also send you some of the publications of our country, *such* as will give you information suited to your wants for aiding in some of your numerous publications. Our new Custom-house is nearly up to the top of the columns, and will be finished in two years probably. The new Merchants' Exchange is in rapid progress, on a much enlarged plan, and will be a good fire-proof building, suited to the uses. The Girard College, at Philadelphia, by Thos. U. Walters, Esq., architect, is a fine building, and will be finished in about two years. The State Capitol at Raleigh, North Carolina, all of granite, is by far the finest building of the kind in our whole country—it will cost over half a million of dollars, and is nearly finished. This building was executed under my charge of the architectural department, and is, as I think, as good as any thing I have ever designed, *which has been executed* in as good material, and with equal workmanship. The Capitol of Indiana is a better design, but is executed in bricks, covered with cement, in imitation of *free-stone*.—Respectfully, dear Sir, your obedient servant,

ITHAL TOWN.

P.S.—I have (since the above was written) just had the honour of a visit at my house in New Haven, from Professor Dobeny, D.D., Professor of Chymistry and Botany at Oxford. I am indebted to Professor Silliman, my nearest neighbour, for this honour; he came with Professor S., and seemed pleased to perceive that we are a little *bitten* with the same disease, that so many of his countrymen are, viz., the book *mania*.

USE OF THE PATENT DIVING DRESSES IN EXAMINING AND REPAIRING SHIPS.

The following extracts describes the service performed by *Mr. Bethell's Patent Diving Dresses* to H.M. ship "The Thunder," at the Bahama Islands, in the West Indies:—

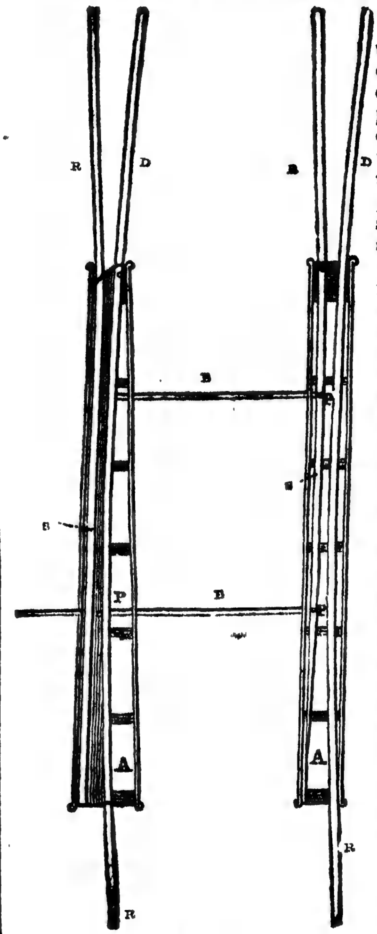
" *The Thunder Surveying Vessel.*—The extent of the injury was exactly ascertained by means of a diving apparatus, kindly lent by a private company at Nassau, who had imported it for the purpose of getting goods out of the holds of vessels sunk in deep water.

" Mr. Wilson, the master carpenter (with a zeal and perseverance that do him infinite credit), after several trials, became so skilful in the use of it, that he was enabled to remain down upwards of half an hour, in three fathoms water, with perfect ease, and nailed two pieces of copper over her worst holes, which gauged $2\frac{1}{2}$ inches deep, thus enabling the ship to make her voyage across the Atlantic, without the smallest increase of leakage. Such advantages should be secured to all our foreign dockyards, for by their being supplied with one of these useful machines, the exact amount of damage to any vessel may always be ascertained, and repaired without loss of time. The Thunder came into harbour on Monday, to be paid off."—*Hampshire Telegraph.*

Improved Diving Dress.—" A trial of Mr. Bethell's diving apparatus was made last week in one of the docks of Portsmouth Dockyard, in the presence of Admiral Sir P. Durham, Rear Admiral Sir F. Maitland, the Master Shipwright, Captains the Hon. R. Dundas, Searle, Maitland, and many other Officers of the Navy and Dockyard, which gave perfect satisfaction. The descent was made by the master carpenter of H.M.S. 'Wellesley,' preparatory to the machine being taken on board that ship, to be conveyed to the East Indies, for the purpose of examining and inspecting vessels which may have touched the ground, and thus, without expense, ascertain the extent of damage sustained, and the repair required. We hope such a useful article will continue to be supplied to all flag-ships, at least, to enable the Commander-in-Chief to hold a survey on vessels, before either the expensive operation of heaving down is resorted to, or the vessels are sent home."—*Naval and Military Gazette.*

With these dresses, a ship can be examined and repaired whilst at anchor, in any depth of water, the diver being seated on a small stage, which is moved about under her bottom.

CURTIS'S RAILWAY SWITCHES.

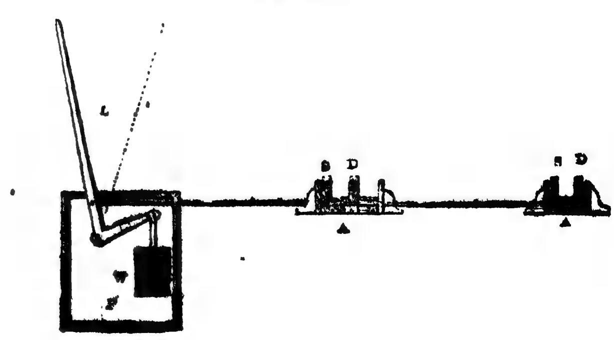


THESE switches, as contradistinguished from those of the ordinary construction, are formed double, one straight bar corresponding with the line, and the other curved, corresponding with the diagonal; by this arrangement the angle is last; thus, a train passes through them with the same smoothness as over the line, and those shocks which are so injurious to the engine and carriages are wholly avoided; besides which, if the curves are formed with the same radii as those upon the line, an engine and train may travel through with perfect safety at full speed. Fig. 1 is a plan of the switches, but in this instance, one of the improved switches are only employed; viz., upon the outside of the curve, which is the guiding rail in all cases, the inner or passive rail being provided with a single-pointed switch: this method is better in the general way than a double switch on both sides, because it is lighter and cheaper, and shuts against a solid rail, thus giving the switch greater solidity than by the other method, and it will, moreover, work more equally; the centre of the double switch is placed in the diagonal rail, thus the engine has always a tendency to keep the rail in its place as it goes over it, whether backwards or forwards.

Fig. 1 is the plan and Fig. 2 the section: the end line R R are the rails of the line, D the diagonals, S the switch-bars corresponding with the straight line, A the bed-frame for the switches to work in, B the connecting bars, one of which is connected with the lever L, P the studs or pivots by which the bars are united to the switches; W is the counterbalance weight, which always keeps the switches right for the line, an important arrangement, which ought never to be lost sight of; F the box for the weight and lever to work in; when the switches are right for the line, the lever occupies the place shown by the dotted line.

Fig. 3 is a plan of the switches so arranged, that an engine can never run off the line under any conditions of the switches being wrongly placed. (We are obliged to postpone the description of this last arrangement until our next Number, in consequence of the wood-cut not being finished.—*Editor.*)

SECTION.



SCIENTIFIC INSTITUTIONS.

ARCHITECTURAL SOCIETY, 35, LINCOLN'S-INN-FIELDS.

Opening Meeting, Tuesday Evening, Nov. 7th, 1837, W. B. Clarke, Esq. President, in the Chair, for the Session 1837 and 1838.

The Meeting was very numerously attended by the profession. We observed among them—Sir Richard Westmacott, R.A., Philip Hardwick, Charles Barry, T. Hopper, C. Fowler, T. Chawner, J. Newman, J. Kay, J. Britton, H. R. Abraham, and F. Wishaw, Esquires.

Numerous drawings were exhibited by Messrs. G. Moore, H. Dewsbury, G. Hawkins, Wm. Grellier, R. E. Philips, G. Alexander, &c., &c., members.

On the table were laid various interesting Works of Art and Portfolios of Drawings by Messrs. Moore, Finden, and Nash.

The Curator announced various donations to the Library and Museum, by J. Britton, Esq., T. L. Walker, H. Dewsbury, R. E. Philips, &c., members.

Mr. Owen Jones (member) contributed some casts taken from the Alhambra, which were elucidated by a view in outline of the interior, beautifully etched by Mr. T. T. Bury, member.

Mr. Cowell also exhibited a very interesting and useful model of his patent Sash Suspender. It is for the prevention of accidents in cleaning windows, and is so simple, that a servant can detach the Sash from the lines and rehang it in one minute. The price is a mere trifle; the fastening prevents the rattling of the Sashes. Also his Patent Sash Fastenings, which are extremely simple, and ought to be introduced by all architects in any new or old buildings, when they have an opportunity of doing so.

W. B. Clarke, Esq., the President, delivered the following address:—

"Gentlemen,—Having been elected for the eighth time your President, the duty of opening our present Session with a short address devolves upon me. I could have wished that the honour of the Presidentship of the Architectural Society had been bestowed upon some other individual better able, by his learning, talent, and genius, to fill this high and important office, rather than so humble and unknown a person as myself. I still hope, however, for the valuable interests of this Society, that the day may not be far distant when some one of the leading Architects of the present period will consider it an honour to direct and improve the architectural knowledge and taste of so large a portion of his fellow-labourers in the same honourable avocation.

"The Architectural Society has laboured for now seven years in those arduous and laudable endeavours, with which it commenced its career, to advance the science by a liberal intercourse amongst its members, and the natural interchange of ideas which must arise from such intercourse. We must all feel, who have participated in the benefits held out to architects by this Society, that our ideas have materially enlarged, that our liberality has been strengthened, and that we have already gathered much valuable information, which unassociated we should not have acquired. The want of this association was deeply felt by all of us previous to the foundation of this Society, and with these feelings we dearly cherish an institution which offers us advantages not to be obtained in any other similar Society, either in this Metropolis, or even in Great Britain. If, therefore, we esteem and value these benefits, how much more estimable must they be to the unpractised student. I consider his coming in contact with a numerous body of architects already in practice, many of whom have travelled, and all, with various and valuable architectural lore, to be an excellent and invaluable advantage conferred by the Architectural Society on him. The liberality of the Members of this Society, in affording every species of information with which they are acquainted, when required of them by the student of the Architectural Societies is such as naturally flows from the worthiest motives; the intention and desire to promote the advancement of architectural knowledge which, when thoroughly understood, and combined with correct taste, honours the country that gives birth to, and matures it. Greece, from her pre-eminence in the Fine Arts, and especially in Architecture, was honoured and respected long after her political power had become insignificant in the scale of nations. Italy, powerless as a divided nation, is still considered the nursery of the Fine Arts, and architects from all quarters of the Globe learn the best principles of architectural taste from the great architects of the *cinque cento* period; nor do we find less learning and combination of form in the earlier architecture of this Island; appropriately, though perhaps erroneously, called English, from the very high state of perfection to which it was brought. To the associated learning of the cloister we are indebted for the superb piles of Gothic building, so finely preserved in this country, and to such learned patrons of art and architecture as William of Wyckham and his predecessors do we chiefly owe the theory and practice in England of this beautiful style of architecture. And here I may reflect, how mainly instrumental in all times, but especially in our own island, have learned men been in fostering and giving a right direction to the Fine Arts. For the introduction and the inculcation of the correct principles of Roman architecture in Britain, we stand, I believe, more indebted than we are aware to the learned men of the fifteenth and sixteenth centuries, who, in the reign of Elizabeth, and still more, in James I., brought in with them from their travels a love for the modern Italian style of architecture, based on the principles and taste practised in the most palmy period of the Roman Empire.

"Considering that Architecture has been admired by, and is indebted to men of science, learning, and research, in all ages, it is, and should always be the endeavour of the Architectural Society, to cultivate the acquaintance of men of science and of letters, assured that, by such a course, they will acquire a more varied store of useful information, which may often be made to bear upon their peculiar art.

"But, however valuable to mankind may be the study of the arts and sciences, and however admirable and delectable may also be the study of Architecture, and useful the practice of it, still we must bear in mind, that in a period of profound peace only can they, and architecture especially, from its costly nature, flourish.

"During the period in which Europe has been afflicted with long and calamitous wars, the arts have been neglected, and have become degenerated and debased. But when peace has been restored, they have gradually risen from their inferiority and debasement, and with the increase of peaceful years nations attest, by their noble works of art, and the monuments of architecture raised throughout their lands, the blessings of peace, and make them, by comparison, detest the misery, waste, and destruction consequent on war and its train of horrors.

"Long has this country enjoyed the advantages of quiet and repose, and the beneficial results are being reaped hourly by its industrious and wise population.

"Animated by so powerful an example, and stored with the experience of history, may we not confidently hope that our youthful, pure, and virtuous-minded Sovereign will, through a long, a happy, and a prosperous reign, cultivate those blessings of peace, on which not merely the Fine Arts and Architecture depend, but the more important welfare and happiness of every class of her subjects.

"If then we shall be blessed with continued peace, abundant time and opportunities will be afforded to the student to acquire, and to the architect to practise, his difficult and arduous profession—a profession in which something new, something valuable, through the longest life, is always to be gained; and the aphorism of *Ars longa, vita brevis*, is one which architects should bear in mind."

The following subjects were announced for the Students' Prizes for the Session 1837 and 1838.

No. 1. Design.—A Public Building for the Exhibition of Painting and Sculpture—comprising

Three Picture Galleries—Sculpture Hall—Entrance Hall, with Check and Money-takers Loggias, and Apartments for the Housekeeper.

A Plan of each Story—One Elevation—Two Sections, and a Perspective View, tinted in Seppia.—To be drawn to a scale of one-eighth of an inch to a foot.

No. 2. Measured Drawing.—Sir Wm. Chambers' Gateway on each side of the Quadrangle of Somerset House, including the two Foot-Portals leading to King's College and Somerset Place.

Accurately measured and figured Drawings, consisting of Plans, Elevations, and Sections, drawn to a scale of half an inch to a foot. One Elevation to be in outline, and one Elevation to be tinted and shaded in Seppia;—also, accurately figured, detail Drawings of the various parts.

No. 3. Essay.—The History of the Arch, giving the date and locality of its Origin:—trace its immediate effect on Architecture, its first introduction into the Ecclesiastical Architecture of Europe, and its various gradations through that style down to the Tudor Arch of our history.

State the Authorities consulted and referred to.

SOCIETY OF ARTS.

Nov. 2, 1837.—The weekly meetings were resumed this evening, W. Pole, Esq. one of the vice-presidents, took the chair. The secretary read the proceedings of the last meeting; after which he read several reports from various committees, particularly of *accounts*. He likewise exhibited the balance-sheet, &c. Many valuable communications and presents, which had been received during the recess, were then announced.

A communication of a donation of 500*l.* was also made to the Society, to be applied in providing annually two handsome silver medals, to be given for drawings, and a model of a design in practical carpentering, as applicable to civil architecture, particularly roofing, centering, &c.; also for drawings of a model of a design in practical carpentering, as applicable to naval and military architecture. Several members were elected, and others proposed.

The following are the subjects chosen for the evening illustrations:—

Nov. 14. } Dec. 12. } On Calico Printing. By the Secretary.

1838. Jan. 9.—On Pigments. By J. Hemming, Esq.

Feb. 13.—On the Application of Machinery to Engraving in Relief. By W. Brockedon, Esq.

Mar. 13.—On Respiration. By M. Truman, M.D.

April 10.—On the Manufactures and Arts of Ancient Egypt. By J. Williams, Esq.

May 8.—On Plain Weaving. By Ed. Cowper, Esq.

June 12.—On Jacquard and other Figured Weaving. By Ed. Cowper, Esq.

Nov. 14.—Alderman Winchester, V.P., in the chair. The secretary delivered a lecture on calico-printing. Mr. Aikin gave an historical detail of the art, interspersing it with many interesting anecdotes, and occasionally adverting to the more recent improvements. He exhibited several ingenious experiments, setting forth the effects of the colouring ingredients, and the progress of applying the mordants. He explained the different stages, from the plain cotton to the most perfect print.

MEETING OF SCIENTIFIC SOCIETIES.

Institute of British Architects, Monday Evening, at 8 o'Clock, Dec. 4 and 18.
Architectural Society - - Tuesday Evening at 8 „ Dec. 5 and 19.
Society of Arts - - every Wednesday Evening at 8 o'Clock.

PARLIAMENTARY PROCEEDINGS.

Conveyance of the Mail by Railways.—Tuesday, Nov. 21.

Mr. Wallace rose to move for the appointment of a Select Committee to inquire into the causes of the irregularities and delays which have taken place in the transmission of the mails by the Railway from Birmingham to Liverpool. It was perfectly well known what great regularity existed under the old mail-coach system in the transmission of the mails, but some irregularities had crept into the new system, the causes of which he was anxious to have investigated by a Committee of the House. Instead of arguing the question, he would state a few facts. The first Railway which had been used on a large scale for the transmission of the mails was that between Birmingham and Liverpool. At first the mails arrived very nearly within their time, but since then they had been gradually losing more and more time, until at length there was a difference of two hours between the time they ought to arrive and the time they really arrived. This has been the cause of great inconvenience, and in Scotland particularly; in consequence of this irregularity, a day was lost in the return of the post. He did not throw blame on any one; he did not know on whom the blame, if there was any, rested. He had merely stated facts which he was prepared to prove before the Committee, if it were granted. Under these circumstances he would content himself with moving for the Committee in the terms of his notice.

Mr. F. Baring said he doubted whether the subject embraced by the motion of the Hon. Member was of sufficient importance to deserve investigation at the hands of the House. The House must recollect, that in the commencement of so great an undertaking they must naturally expect some accidents; and he thought that it was scarcely worth the attention of the House, under the circumstances, either to pass censure upon, or to take means to ascertain, the causes of these accidents. One sub-

ject connected with the conveyance of the mails by Railroads was under the consideration of the Government, and became, in his opinion, a very serious question, and one which ought to be brought before a Committee of that House, for the purpose of taking their opinion upon it. The House would observe, that the moment the mails were conveyed by the Railways, from that moment they put down the mail coaches, and they would be left in this situation, that the proprietors of the Railways would have an entire monopoly of the road. There would be no possible means of any thing like competition, and of thereby meeting the demands which they might choose to make. He did not wish to make any invidious observations, nor was he connecting this subject with the Railway in question; but cases might occur, and must occur before long, of the nature he had stated, and he thought it was a fair subject for the consideration of the Committee of that House to inquire what means should be taken, and what power given to the Government for the purpose of procuring for the public the use of those Railroads which by Act of Parliament were allowed to be constructed. With this view he would, on a future occasion, propose the appointment of a Committee on this subject, if the Hon. Member for Greenock would have no objection to withdraw his present motion.

Mr. Wallace said he was extremely gratified with the announcement of the Hon. Gentleman, and would gladly acquiesce in his suggestion.

The motion was then withdrawn.

Petitions on Private Bills.

On the motion of Lord J. Russell it was resolved, that no Petitions or Private Bills should be received after Monday, the 5th of February; and that no Private Bill should be read a first time after Monday, the 26th of March; and that the House should receive no Reports on Private Bills after Monday, the 11th of June.

Friday, Nov. 24.

Mr. Guest intimated, that on an early day he would call attention to the orders of the House regarding Railway Bills

LAW PROCEEDINGS.

The Queen v. the London and Birmingham Railway Company.—In this case a rule had been obtained to show cause why a *mandamus* should not be issued to the defendants, commanding them to set out a road according to the provisions of the Act under which the defendants were authorized to proceed with their works. The defendants had diverted a part of a road lying between Stanmore and Uxbridge, and it was stated that the road they had made was not so convenient as the old road. There were two clauses in the Act relating to this matter; one as to diverting a road for a temporary, the other as to diverting it for a permanent purpose. In the first of these cases the new road was expressly directed to be made as convenient as the old road. There was no such express direction with respect to the permanent road. In the present instance it was stated in the affidavits on which the rule was obtained, that the former road was forty feet wide, that the hard road itself occupied twenty-two feet, that there were three feet of footway, and fifteen feet of greensward, and that there was no greensward on the sides of the new road, though it was absolutely necessary that there should be some for the cattle which had to pass along and be upon the road. On the other hand, it appeared that the hard road was now wider than it had formerly been, and it was argued, that as there had been no express direction with respect to the permanent roads being exactly the same as the old roads, this rule could not be maintained.

Sir W. Follett and Mr. Channell were heard against the rule, and the Attorney-General appeared to support it.

The Court made the rule absolute.

LIST OF PATENTS GRANTED BETWEEN THE 2nd AND 28th NOVEMBER, 1837, BOTH INCLUSIVE.

Joseph Whitworth, of Manchester, in the county of Lancaster, Engineer, for his invention of "Certain Improvements in Locomotive and other Steam Engines."—2nd November; 6 months.

Richard Burch, of Heywood, in the county of Lancaster, Engineer, for his invention of "Certain Improvements in Manufacturing Gas from Coal."—2nd November; 6 months.

Joseph Lockett, of Manchester, in the county of Lancaster, Engraver, for "Certain Improvements in the Art of Printing Calicos and other Fabrics of Cotton, Silk, Wool, Paper, or Linen, separately or intermixed; being a communication from a foreigner residing abroad."—2nd November; 6 months.

James Gowland, of Leathersellers Buildings, in the parish of Allhallows in the Wall, within the city of London, Watch and Chronometer Maker, for his invention of "A certain Improvement, or certain Improvements in the Mechanism of Time-keepers."—2nd November; 6 months.

Richard Joshua Tremonger, of Wherwell, in the county of Hampshire, Esq., for his invention of "An Improved Spring, or Arrangement of Springs for Wheel Carriages."—4th November; 6 months.

John Upton, of New Street, Southwark Bridge, in the county of Surrey, Engineer, for his invention of "An improved Method or Methods of generating Steam Power, and applying the same to Ploughing, Harrowing, and other Agricultural Purposes, which Method or Methods is, or are also applicable to other Purposes to which the power of Steam is, or may be applied."—4th November; 6 months.

Ernest Adolph Ortman, of Stockholm, in the kingdom of Sweden, now of Ebenezer Place, Limehouse, in the county of Middlesex, for his invention of "A Method, or Methods of freeing, or wholly or partially, wooden or other porous vessels from certain foreign Matters or Substances which they are liable to absorb, and of turning to a useful account the foreign Matters or Substances so liberated or extracted."—4th November; 6 months.

George Deakin Midgley, of the Strand, in the county of Middlesex, Chemist, and John Howard Hyan, of Cheltenham, in the county of Gloucester, Esq., for their invention of "An improved mode of extracting or obtaining Ammoniacal Salts from liquor produced in the Manufacture of Coal Gas."—4th November; 6 months.

William Arthur, of Glasgow, North Britain, Machine-Maker, for his invention of "Improvements in Spinning Hemp, Flax, and other Fibrous Substances."—4th November; 6 months.

Tobias Michell, of Kingsland Green, in the county of Middlesex, Gentleman, for his invention of "Improvements in Washing or Purifying Smoke and Vapours evolved from Furnaces of various Descriptions."—7th November; 6 months.

Thomas Hughes, of High Holborn, in the county of Middlesex, Truss Maker, for his invention of "An Improvement in Stocks, Cravats, or Stiffners."—7th November; 6 months.

Charles Francais Edward Dulas, of 38, Grande Rue Verte, Paris, in the kingdom of France, but now of Cockspur Street, in the county of Middlesex, Gentleman, for "A New and Improved Method of Cutting and Working Wood by Machinery; being a communication from a foreigner residing abroad."—7th November; 6 months.

John Potter, of Amoats, near Manchester, in the county of Lancaster, Cotton-Spinner, for his invention of "An Improvement or Improvements in the Process of Preparing certain Descriptions of Warps for the Loom."—9th November; 6 months

James Slater, of Salford, in the county of Lancaster, Gentleman, for his invention of "Certain Improvements in Steam-Engines, and also in Boilers and in Furnaces used for the Generation of Steam, or other useful Purposes."—9th November; 6 months.

Charles Royr Williams, of Liverpool, in the county of Lancaster, Gentleman, for his invention of "Certain Improvements in the Manner of Preparing the Vegetable Material of Peat Moss, or Bog, so as to render it applicable to several useful Purposes, and particularly for Fuel."—11th November; 6 months.

Henry Crosley, of Hooper Square, in the county of Middlesex, Civil Engineer, for "Improved Means to be employed in Manufacturing Beet-Root and other Vegetable Substances, for the purpose of obtaining Saccharine Matter therefrom; being a communication from a foreigner residing abroad."—11th November; 6 months.

Hamer Stansfeld, of Leeds, in the county of York, Merchant, for "Certain Machinery of a Tappet and Lever Action, to produce a Vertical or Horizontal Movement, through the medium of Ropes or Bands working over, under, or round Pulleys; being a communication from a foreigner residing abroad."—14th November; 6 months.

William Coles, of Charing Cross, in the county of Middlesex, Esq., for his invention of "Improvements in Gunnery and in Gun and other Carriages, and in the means of connecting the same."—14th November; 4 months.

Robert White, of Nottingham, Lacemaker, for his invention of "Improvements in the Manufacture of Ornamental Lace."—14th November; 6 months.

Robert Whitfield, of Hercules Buildings, Westminster Road, in the county of Surrey, Gentleman, for his invention of "A Composition which he denominates an Indelible Safety and Durable Black Fluid Writing Ink."—14th November; 6 months.

John Jeremiah Rubeni, of Birmingham, in the county of Warwick, Umbrella Manufacturer, for "Certain Improvements in the Manufacture of Part of the Furniture of an Umbrella; being a communication from a foreigner residing abroad."—14th November; 6 months.

Joseph Birch Mather, of Nottingham, Mechanic and Setter-up of Hosiery Frames, for his invention of "Certain Improvements in Machinery employed in Manufacturing Hosiery Goods, or what is commonly called Frame-work Knitting."—14th November; 6 months.

William Male Clay, of West Brunswick, in the county of Stafford, Manufacturing Chemist, and Joseph Denham Smith, of St. Thomas's Hospital, in the borough of Southwark, Student in Chemistry, for their invention of "Certain Improvements in the Manufacture of Glass."—16th November; 6 months.

William Herepath, of the city of Bristol, in the county of Somerset, Philosophical Chemist, and James Fitchew Cox, of the same place, Tanner, for their invention of "Certain Improvement or Improvements in the Process of Tanning."—16th November.

William Fourness, of Leeds, in the county of York, Painter, for his invention of "A certain Improvement or Improvements in Ventilating Pits, Shafts, Mines, Wells, Ships' Holds, or other confined Places."—16th November; 6 months.

James Buckingham, of Miners' Hall, Strand, in the county of Middlesex, Civil Engineer, for his invention of "Certain Improvements in the Means of Ventilating Mines, Ships, and other Places, and an Apparatus for effecting the same."—16th November; 6 months.

Thomas Birch, of Manchester, in the county of Lancaster, Machine-maker, for his invention of "Certain Improvements in Carding Engines, to be used for Carding Cotton and other Fibrous Substances."—18th November; 6 months.

Elisha Haydon Collier, of Globe Dock Factory, Rotherhithe, formerly of Boston, North America, for his invention of "Certain Improvements in Machinery, applicable to the raising Fluids and other Bodies."—21st November; 6 months.

Christopher Nickels, of Guildford Street, Lambeth, in the county of Surrey, for his invention of "Improvements in Embossing or Impressing the Surfaces of Leather and other Substances, applicable to various Purposes."—21st November; 6 months.

Elisha Wykde, of Birmingham, in the county of Warwick, Engineer, for his invention of "Certain Improvements in Locomotive and other Engines."—21st November; 6 months.

James Matley, of the city of Paris, in the kingdom of France, and of Manchester, in the county of Lancaster, Gentleman, for his invention of "Certain Improvements in Machinery for the Operation of Tiering used in Printing Cotton, Linen, and Woollen Cloths, Silks, Papers, and other articles and substances to which Block Printing is or can be applied."—23rd November; 6 months.

James Jamieson Cardes, of Idol-lane, in the city of London, Merchant, for his invention of "An Improved Mortar for Dressing Rough or Paddy, or Redressing."—25th November; 6 months.

Henry Purser Vaile, of Oxford-street, in the county of Middlesex, Civil Engineer, for his invention of "Improvements in Rails for Rail-roads."—25th November; 6 months.

Richard Tappin Claridge, of Salisbury Street, Strand, in the county of Middlesex, Gentleman, for "A Mastic Cement or Composition applicable to Paving and Road-making, covering Buildings, and the various Purposes to which Cement, Mastic, Lead, Zinc, or Composition are employed; being a communication from a foreigner residing abroad."—25th November; 6 months.

Samuel Cocker, of Porter Works, Sheffield, in the county of York, Manufacturer, for his invention of "Improvements in Making Needles."—25th November; 6 months.

Thomas Moore, of Ison Green, in the county of Nottingham, Lace Manufacturer, for his invention of "Improvements in Machinery for Frame-work Knitting."—27th November; 6 months.

Samuel Draper, of Basford, in the city of Nottingham, Lace Manufacturer, for his invention of "Certain Improvements for producing Ornamental Lace or Wearings."—27th November; 6 months.

John Dover, of Thames-street, Merchant, and William Jones, of Bartholomew Close, Chemist, both in the city of London, for their invention of "Improvements in Filtering Fluids."—28th November; 6 months.

STEAM NAVIGATION.

Iron Vessels.—We noticed, a short time ago, the arrival at Alexandria (after a passage of eighteen days steaming from Liverpool) of the iron steam yacht, *l'Egyptien*, constructed at the Birkenhead iron-works. Letters have, we understand, been received respecting her by the last Malta packet stating, that she had made two voyages from Alexandria to Candia with government despatches, and was afterwards tried on the Nile, under the direction of one of the Pacha's admirals, attended by a number of officers, whose report of her qualities were so satisfactory, that, on the 17th September, the Pacha and his suite embarked on board her, and proceeded up the Nile to Cairo. The voyage of this vessel out to Alexandria, and the fact of her having been twice subsequently employed to convey government despatches on a passage of considerable length and difficulty, prove that the compass on board her acts with perfect accuracy, and that iron vessels can be constructed of sufficiently light draft of water to render them suitable for the navigation of shallow rivers with the model and strength of sea-going steamers.—*Albion.*

The Great Western Steam Ship is now in the East India Dock having her engines put on board, which are manufactured by Messrs. Maudsley and Co. The four immense boilers are already fixed, also several portions of the engine. The weight of each paddle-shaft, after being turned, weighs 6½ tons, and the intermediate shaft 4½ tons: their respective diameters are 18¾ and 17½ inches; they were forged at Messrs. Accerman's Bristol Iron-works. The state cabin is to be fitted up in the very first style of elegance; no expense is to be spared to render the vessel commodious and suitable for passengers.

The Semiramis War Steamer has been fitted out for immediate service for the East India Company.

New South Wales.—Steamers are much wanted at this colony: there is one only, which makes more than 200*l.* per week.

Practice v. *Theory.*—The Aire and Calder Navigation have lately suffered an immense loss, from the failure of two powerful boats, the *Vanguard* and *Jason*, built to navigate the shallows of the Humber, in the trade between Goole and Hamburgh. The two vessels were built under the direction of the Company's land-surveyor, from a *model;* but when afloat, to the consternation of all parties, were found to draw as much water, without their lading, as rendered them useless. They were built at Glasgow, and have powerful engines: they lie in the East India Docks—*as models!*

Practice v. *Theory: Incrustation of Boilers.*—When Dr. Lardner was lecturing in Hull last autumn, he remarked largely upon the loss of steam from incrustation, by saline deposit in the boilers of marine engines, and proposed, as an effectual remedy, the substitution of copper for iron; the copper, as he alleged, having a detergent power, and not being a recipient of deposit. An operative, who listened, begged the learned Doctor to accompany him to the Hull Docks, where he produced a copper pipe so fully incrusted, and so closely adhered to the saline incrustation, that it withstood the blows of a chisel and sledge hammer used to separate it. Dr. Lardner has subsequently made the discovery public in some official reports; but we have not seen it in any other form. As the former opinion was frequently propagated by lectures on Steam Navigation to India, and others given by Dr. Lardner, we think that the mistake should be published, and the lovers of science be practically informed without delay.

Steam Communication in Austria.—The Emperor of Austria is giving every possible encouragement to railroads and steam-navigation in his part of Germany. He has lately directed the bridge of Vienna over the Danube, which, from the lowness of the arches, has been hitherto an obstruction to the navigation of that river, to be so altered as to allow the steam-boats to pass under it, and this at the public expense. This bridge was the chief obstacle in the way of communication between Vienna and Lentz hitherto.—*Morning Herald.*

ENGINEERING WORKS.

RAILWAYS.

South Eastern Railway.—The contractors have commenced the works at Shakspeare's Cliff, near Dover, where the cliff is very high and exceedingly rugged. A double tunnel is to be cut through the cliff, and formed out of the solid chalk with Gothic pointed arches. There are to be shafts for ventilating, and side galleries cut from the Tunnel to the side of the cliff on a level, to facilitate the removal of the excavations, which are to be shot over on to the sea beach below. W. Cubitt, Esq., is the engineer under whose directions the works are to be executed.

Greenwich Railway.—We are happy to find there is more activity now shown for the finishing of the remainder of the railway than there has been for some time since. We trust that the Directors will proceed with vigour, and will put their *railway in order.* We suggest, that if the roadway was levelled on the side of the arches for a mile from Tooley Street, and the arches made impervealble to wet, which can be easily done, a rental might be very soon raised, and the arches converted to some useful purposes; if not for houses, they might be adapted for manufactories, warehouses, &c.; we are convinced that the street would soon become a very great and leading thoroughfare to Rotherhithe, Deptford, and Greenwich, and greatly improve the neighbourhood.

London Grand Junction Railway.—We understand the Directors of this Company issued 150 writs in one day for the enforcement of the calls. What use is it for the Directors making any further calls, or attempting to proceed with the works, until they obtain a new Act of Parliament for an extension of the time for purchasing the property and making the railway? It appears to us morally impossible that the property can be purchased within the time allowed by their present Act.

Leith and Edinburgh Railway.—This railway is begun, and some progress made in the cutting and embanking.—*Edinburgh Courant.*

North Union Railway.—The works on this line are at present making rapid progress at the Wigan end. The erection of two iron bridges, one over Walgate, and the other over Chapel, are now in progress, and they are expected to be an ornament to that town.—*Preston Chronicle.*

Railway over Morecambe Bay.—Great interest has been excited by Mr. Stephenson's survey of the country between Lancaster and Whitehaven, with the view to he formation of a line of railway. We understand the project of the embankment of Morecombe Bay is viewed with much interest by a great many influential gentlemen in the metropolis.—*Preston Pilot.*

Brighton Railway.—The public will soon be able to form a more decided judgment on this undertaking than they have been able to do. The united Committee, after having encountered much difficulty, have at length put things in a favourable train; they have been joined by the shareholders of the whole of the different lines, and although five places are vacant in the direction, by the retirement of Stephenson's portion of it, these will, in due course, be filled up by most influential and respectable gentlemen. A report on the direct line will be presented at the end of this month by Sir J. Rennie and Mr. Rastrick, and which, we are assured, will fully clear up whatever doubts may at present exist as to this being the only line of rail and which can be carried into effect consistently with the interests of Brighton.—*Brighton Herald.*

Manchester and Birmingham Railway.—We are authorized to state, that, in the event of the Manchester and Sheffield Railway being abandoned, it is the intention of the directors of this company to consider carefully the best means of connecting, by a desirable branch, Ashton-under-Lyne and Stalybridge with their intended main line, so as to give to that important and extending district the benefit of a railway communication with Manchester.—*Manchester Guardian.*

Midland Counties' Railway.—At a full meeting of the directors of the Midland Counties' Railway, held at Loughborough, on Tuesday, the contracts for the whole of the line from Leicester to Rugby were let to that eminent contractor, Mr. Mackintosh, of London, who has engaged to have the works completed in two years and a half, from the 1st of November. As the heaviest portions of the work are in this line, it is supposed that the entire line will be open in three years at the most from the present time. The works between Nottingham and Derby are in a course of rapid progress, and it is expected that that part of the line will be opened in little more than a year.—*Mining Journal.*

Railway from London to Glasgow, via Carlisle, Dumfries, &c.—Spirited meetings have been held, and resolutions come to, on this subject, along the Glasgow line, from Dumfries to Kilmarnock. The course adopted is just what is required; and, no doubt, if the members of the Committee act with spirit, the survey will not be long in being got. The Town Council of Kilmarnock have moved in the matter, and appointed a Committee to procure the necessary subscriptions. A public meeting is also about to be held in Annan on the subject; so that little fear need now be entertained that the proposed survey will not be obtained. We regret that, in some parts of our own town, considerable dilatoriness has been shown in pushing the subscriptions; and, in looking over the subscriptions, we observe a number of respectable names—some of them public men, too—who have not yet subscribed. We trust the subscription-list will not long remain in that state. And there are several enterprising and influential proprietors interested in the district and line whose names are not in the list. We fear there is not a little neglect in several quarters. Now is the time for all parties to remedy the evil. We again say to the inhabitants in the whole line, be up and doing.—*Dumfries Times.*

Pincock Bridge—The Railway.—The bridge at Pincock, over which passes the high road hence to Wigan, and which, as we stated in our last publication, had suffered materially from the eruption of the waters from the railway embankment above, has given way on the south arch and abutment. It is considered in so dangerous a state, that our townsman, Mr. Woods, stone-mason, who yesterday inspected it (on behalf of Mr. Dewhurst, the bridge-master, who is ill), immediately railed it across to prevent carts or other carriages from passing. Should it fall, a temporary bridge of balks will be constructed to serve during the winter. We understand that it is in contemplation to build a bridge in lieu of this, a little higher up the valley, and we would suggest that, whether it be rebuilt on its present site, or elsewhere in the valley, it should be of greater elevation, and mounded up so as to reduce the acclivity on either side. We learn that about 140 men are employed, at the fallen railway bridge above, in removing the materials so as to come at the foundation for a new bridge. The bridge will, we are further informed, be, in the first instance, constructed of wood, so that the embankment may be carried over without loss of time; and a stone bridge will be thrown over, within the frame-work of the temporary structure, after the superincumbent materials of the embankment have become settled and compacted. —*Preston Observer.*

Bristol and Exeter Railway.—The Bristol and Exeter Railway contract, No. 1, commencing at Pile-hill, near Bristol Iron Bridge, has been begun. In a few months that part of the line from Bristol to Weston-super-Mare and Bridgewater will be finished, as several miles of contracts, Nos. 2 and 3, are completed. This line of road is a continuation of the Great Western, by the union of the two lines in Temple Meads; and the inhabitants of Bath will, by next summer, be conveyed to Weston-super-Mare in one hour, being a distance of 30 miles.—*Western Luminary.*

London and Greenwich Railway.—The number of passengers conveyed on this line, without the slightest accident, from November 12th to the 16th, is 17,940, and the amount received 454*l.* 5*s.* 0*d.*, which, with 8*l.* 5*s.* 0*d.* from the footpath, makes a revenue, in five days, of 462*l.* 10*s.* 0*d.*

Lancaster and Preston Railway.—Mr. Locke, the engineer, paid us a visit last week, and at his instance the whole line of railway has been re-measured, and some slight variations and improvements have been determined on. We understand the plans for the owners of property on the line are now mostly made out, and that the directors are engaged in negotiations for the purchase of land with the various owners through whose property the railway is intended to pass.—*Lancaster Guardian.*

Longridge Railway.—The Annual Meeting of the shareholders of the Longridge Railway was held on Saturday last at the Town Hall. The business transacted was brief but gratifying. A short report was read, by which it appeared that such progress had been made in the formation of the line as gave assurance of its completion at no distant period. The utility of this railway, and its increasing prospects of success, may be learned from the fact, that not only is the demand for stone from the Longridge Quarries in great requisition for this town and neighbourhood, but for Liverpool and other remote places. The difficulty of conveying it, owing to the state of the common roads, has latterly been great. Some blocks of stone, of six yards in length, and ten tons in weight, have recently been sent to Liverpool, for, we believe, columns for a large public building; and for these, carriages have been sent from that town, there being none here of sufficient size to convey them. By the railway, stones of any required dimensions may be brought down.—*Preston Observer.*

Railway from Glasgow to Carlisle.—It is said that Mr. Locke is at present engaged in a survey to discover a line of railway from Glasgow to Carlisle, as well as between the latter city and Edinburgh. Mr. L. is reported to be perfectly satisfied of the practicability of the Shap Fell Line, and that he prefers it to the line through West Cumberland. Mr. Locke may have traversed the route of the Western line, but, judging from his report, we should have no hesitation in saying, that he had never either passed through the district, or dreamt of an opening in that direction previous to the publication of that document. Report says, that the gentlemen of Penrith intended shortly to call a public meeting in support of a line of the railway over Shap Fells.—*Cumberland Pacquet.*

Glasgow, Paisley, and Greenock Railway.—We perform a very gratifying duty in again directing public attention to the progress which is now making towards the execution of the railway between this town and Glasgow. The name of Mr. Joseph Locke as engineer, gives the best assurance of the speedy and masterly execution of the work, which, we understand, will be commenced with vigour, at various parts of the line, so soon as the weather will permit. We may thus hope to see part of it open within a short time, and the whole line completed in little more than two years. This we hold to be a subject of sincere congratulation to the west of Scotland generally, and to the dwellers on the Clyde in particular. Our railroad is the first link in the connecting chain of rapid communication throughout Scotland from west to east, and we cannot conceive any work better calculated to insure great and certain advantages to all concerned. A railroad, 22 miles in length, without one engineering difficulty, with one terminus in the centre of Glasgow, and the other at the Harbours of Greenock, passing through the very midst of Paisley and Port Glasgow, and bringing all these important and populous towns into immediate connexion with each other; such is the "Glasgow, Paisley, and Greenock Railway," and we doubt if, there is another district so favourable for such a purpose in the whole world of business and of bustle.—*Greenock Advertiser.*

West Cumberland.—The proposed line of railway bearing this title, is intended to be a line of connexion between Lancaster and Carlisle *via* the western coast of Cumberland. Mr. Stephenson, who was employed to survey the country along which it is proposed to run, has reported favourably of it, giving his opinion that it affords every facility for railway communication. Lord Lonsdale has written to the projectors, stating his concurrence in their views with respect to that portion of the line connecting Whitehaven with Maryport, and expressing his willingness to forward them; and with respect to the more extended line to Lancaster, his lordship says, he is not prepared at present to give any opinion. The Whitehaven Committee have addressed the Lords of the Treasury, requesting them to employ government engineers to survey the proposed Grand Junction line in order to ensure a good and safe railway and test the practicability of an embankment across Morecambe Bay.—*Globe.*

Great North of England Railway.—A contract for the formation of a considerable portion of this line of railway, south of Darlington, was let on Tuesday, the 31st October, and will be forthwith commenced.—*Sunderland Herald.*

Edinburgh and Glasgow Railway.—A meeting of the shareholders of this undertaking was held on Wednesday, 9th November, at Edinburgh, the Lord Provost in the chair, to lay before them an account of the proceedings of the directors, and to consider what measures should be now adopted. The chairman said, he hoped that there was but one opinion among the subscribers, as to the propriety of persevering in the endeavour to procure the sanction of parliament to their project, as he knew of no public measure that would be of more utility to Scotland. The secretary then read the report, which detailed the steps taken last session with a view to procure the act. The report stated, that the bill, after it had passed the Commons, and the standing orders of the House of Lords, had been stopped further progress by the dissolution of parliament, consequent upon the demise of the crown. The shareholders were recommended to contribute one pound a share further, to enable the directors to proceed with the bill in the ensuing session, as the funds were exhausted. A large number of the shareholders, it was mentioned, had already agreed to the proposal for another call. A series of resolutions were agreed to unanimously, in furtherance of the object of the company: several of the movers impressed upon the meeting the propriety of the shareholders keeping together and acting in a united and determined manner in all their proceedings. Mr. Sandford thought that the bill would be allowed to proceed under the old standing orders, by which means it would be passed *pro forma* through the House of Commons, and be taken up at the stage at which it was stopped on the dissolution of parliament. In reply to a question on the subject, it was stated to be the intention of the directors to proceed with a renewed application for the bill, should they not succeed in their attempt in November to get the bill forwarded as they expected.—*Railway Times.*

Aylesbury Railroad.—Active preparations are about to be commenced for laying down a line of railway from the town of Aylesbury, to join the London and Birmingham line at Cheddington, near Marsworth. The distance is computed at about seven miles, and from the very level state of the ground it is thought that the expense will be trifling compared with the enormous outlay of money which some branch railways require.—*Railway Times.*

North Midland.—This line of railway, betwixt Chesterfield and South Wingfield, is in a very forward state; and preparations are making to commence the contracts between Stalforth-lane, through Chesterfield to Staveley. Clay Cross Tunnel is now progressing with spirit. Six steam-engines for the purpose of pumping water and drawing earth are in constant work. The whole of the tunnel being in coal measures, is considered to be favourable to the undertaking; and although the influx of water is considerable, yet it is certainly not greater than was anticipated. From fifty to sixty yards of the tunnel has already been bricked in. The work, which progresses night and day without intermission (Sundays only excepted), is carried on by what is called "lengths" of four yards each at a time. When the miners have cleared away the earth, the required space (four yards), they remove to another part, and bricklayers take their places. The inverted part of the arch, and the side walls, are about eighteen inches in thickness; the top arch is twenty-seven inches thick generally, but it is a little varied according to the nature of the ground. The whole of the bricks are laid in Roman cement. The make of bricks last summer was about four-and-a-half millions; next summer it is intended to make seven millions; and the summer following four or five millions. The tunnelling can be proceeded with at ten different places at the same time, viz., by five sets of miners and five sets of bricklayers, alternately changing places. There are about ten or a dozen miners in a set, and if the work is tolerably dry overhead, they continue at work twelve hours, when a fresh relay of men take their places; but if much water drains on the men from the roof of the tunnel, they work only [illegible] hours at a time. The [illegible] miners are at the rate of about 8d. per hour. A set of miners (meaning here the double or treble set, to bring round the twenty-four hours) can excavate a four-yards length in about nine days, under ordinary circumstances, and this can be done, as has been before observed, at five places at the same time, which is at the rate of about fifteen yards per week, or about 780 yards per year; and as the tunnel is to be 1800 yards in length, it will, of course, take about two years and a half from the present time to complete it. We are aware that the contractors have engaged to finish it by the 1st of May, 1839; but this is considered to be impossible. A great many hands are employed on the deep cuttings of each end of the tunnel, and so large a congregation of course renders cottages and lodgings very scarce and dear at Clay Cross and the neighbourhood. This scarcity of cottages and lodgings has caused about thirty houses, or rather cabins, to be built with sods in the neighbourhood; and notwithstanding this great mart for human labour, troops of men are daily applying for work, who cannot obtain any.—*North Derbyshire Chronicle.*

Durham Junction.—The magnificent viaduct, which is now being erected over the valley of the river Wear by the Durham Junction Railway Company, is almost finished. When completed, taking the span of the different arches and the immense height into consideration, it will eclipse in grandeur any bridge hitherto erected in the United Kingdom. It consists of four large arches, and six smaller ones, and is 810 feet 9 inches in length. The principal arch, which is thrown over the bed of the river, is of 160 feet span, and forms almost a semi-circle; there is another arch of 144 foot span, and two of 100 feet span each. The height, from the foundation of the centre pier to the top of the parapet, is 158 feet. The three smaller arches, and the 100 feet arch, on the south side of the river, are completed, and the centering entirely removed.—*Globe.*

FOREIGN RAILWAYS.

Railroads in Belgium.—The line by which the Belgians propose to connect their western boundary, looking on the sea, with their eastern, bordering on Germany, is already so far advanced as to be opened from Tirlemont to Ghent on the 29th of September. When the whole line is completed, the journey by steam-packet and railway, between London and Brussels, will be effected in sixteen hours. Mr. Simons lately visited all the works preparatory for laying down a railroad from Ghent to Bruges; the operation of levelling is finished as far as Beerren, two leagues from Bruges. Mr. S. seems to be sure that the section from Ghent to Bruges may be opened in the month of May, next year, and that from Bruges to Ostend in the month of June following. The railroads now laid down in Belgium cover a length of ground equal to 143,720 metres, or about thirty-six post leagues. A few days ago, the English workmen employed in directing the locomotive engines on the railroad mutinied, in consequence of an order from the administration, that Belgian workmen should be taught how to direct the machines. The arrest of one or two of them, who refused to direct the trains, speedily restored order amongst the rest; and to do away with their apprehension of losing their situations, as soon as a sufficient number of Belgian workmen were able to supply their places, the administration has since entered into an engagement with them, which can be broken only under circumstances of gravity, and which have been previously specified.

Prussian Railroad.—The cost of the railroad to be constructed from Strasburg to Basle is estimated at twenty-five millions of francs. The subscription in the two cities already amount to nearly sixty millions of francs.—*Mining Journal.*

Berlin.—The manufactories of Berlin have greatly increased within these few years. At present a very extensive cotton-manufactory is erecting by one of the richest citizens of Berlin; a powerful steam-engine is to be used also to work a steam-mill. The quantity of Prussian manufactures sold at the great fairs is constantly increasing, and the manufacturers of Berlin are now so flourishing, that several of the larger ones employ 1000 workmen.—*Suabian Mercury.*

Foreign Patronage of Railways.—General Scheff'king, aide-de-camp to the Emperor of Russia, accompanied by a young Russian *savan*, has just made a tour in the north of England, by order of his sovereign, to make himself acquainted with the construction of the railroads and the locomotive-machines. We are assured that immense railroads are about to be laid down in Russia, for which machines are to be purchased from the manufactories on the Tyne and the Wear. A similarly great work in the north of Germany is on the eve of being commenced.—*From No. 1 of a New French Journal, published in London, under the title of "Le Miroir de Paris."*

Foreign Railways.—The head-quarters of the Belgian railway engineers are now transferred to Liege, where a building of some consequence has been purchased by the Government for their accommodation, to enable them to superintend more conveniently the continuation of the great national line of railway to the frontiers of Prussia. The meeting of the Prussian and Belgian lines will take place in a tunnel on the frontier, and the line is already marked out by signal posts from this place of meeting to Cologne. Great activity prevails in the preparations for the Austrian line from Vienna to Gallicia through Moravia, which will avoid the mountains of Auspitz and Austerlitz, but will have to encounter some difficulties in passing through the defiles near Neu-Titschin. The success of the railroads already opened abroad, appears to be quite satisfactory. On the first day of the opening of the first railway direct from St. Petersburgh, the number of passengers was only 1668, and only ten journeys were made, but the numbers rapidly increased. On the fifth day there were twelve journeys, and 4081 passengers, and the receipts for the first five days were 21,155 rubles 40 kopeks, or nearly £900 sterling. In Belgium, the Government have given orders to double the number of locomotives now on the rail.—*Railway Times.*

Naples, Oct. 29.—The railroad from this city to Castellamare will be commenced in the month of November. M. Bayard, of Paris, the contractor, arrived here several weeks ago.—*Morning Chronicle.*

American Railroads.—A singular and wonderful feature of America is her vast and increasing extent of railroads—while the English have almost stood still, contemplating with great complacency the two or three which they have made—the Americans have laid down 2000 miles of railroads, many of them as good, for all practical purposes, as the Liverpool and Manchester. Many circumstances conspire to assist the Americans in the construction of these roads; the alluvial plains, which often present a dead level for a hundred miles together; the great plenty of timber, and, more than all, the non-appropriation of the ground, which enables the projectors to buy it for a trifle, and in the majority of cases to get it for nothing. They have pushed these roads into the very bosom of the wilderness. Like the military roads of the Romans, they hold steadily and straight on through plain and morass, [illegible]

that skirt the banks of the Mohawk; and where a few years since an Indian hunter could scarcely force his way, you now dash along at the fearful velocity of twenty miles an hour. Many of these roads have been finished for less than 5000 dollars a mile; the very best of them, made of English iron, and laid down on stone sleepers, have been completed for 29,000 dollars a mile, or about £6000, which is only one-seventh the cost of the Liverpool and Manchester. The same method and dexterity which marks their steam-boat travelling is also seen here: the engines are nearly all of American construction, having superseded those imported from England, and the engineers seem to have them under better control. There is certainly no unnecessary expense about these railroads. The sleepers are often not filled up, and frequently in passing a deep chasm, or rushing torrent, the bridge is only just wide enough for the rails. Most of these railroads are at present single tracks, which occasion delay when trains meet. The carriages are larger than ours, they are sometimes fifty feet long, and have a dock with verandas. I have often remarked, that American engineers seem more dexterous than English. I have seen a train going seventeen miles an hour stopped in forty yards. The engine carries a large shovel in front, which removes any obstacle lying on the rail. Riding on the engines of a Washington train at night, I saw a cow lying on the rails; before I could exclaim, we were upon her, and I expected a shock, instead of which, the shovel picked her up, carried her a few yards, and then threw her to the road-side, out of the way. I took many opportunities of riding on the engines; wood is burned in most of them, anthracite coal in few. The cylinders are mostly horizontal, like our own; but I saw several where the cylinders were vertical. There is a fine road from Albany, on the Hudson, to Utica, ninety miles. This road, in a few months, will reach to Buffalo, on the lake Erie, and then a traveller may pass from New York to Niagara in twenty-four hours. There are railroads throughout all the New England States to every town of importance, and some thousand miles in progress in the South and west. There is the least improvement in the slave states. There is no country where you can cross such vast tracts in so short a time as in America, and the facilities are every day increasing. The Ohio already joins the Delaware by a railroad 350 miles long; and in a few years a traveller may be able to pass from the Gulf of Newfoundland to the Gulf of Mexico; from icebergs to orange-groves, in six days.—*Leicester Mercury.*

Leeds Water Works.—The supply of water afforded by the present works is from the River Aire, which drains, and stains rather than washes, the feet of the bold eminences upon which Leeds is built. At Leeds Bridge, where the outpourings of dye-houses, fellmongers, and chemical-works, discharge their refuse, stands the present water engine, a lazy old water-wheel, which lifts into elevated reservoirs the mucid quantum of supply, equal to about one gallon per day for each inhabitant, and with this have the population been hitherto content. A bill is now before us which passed during the last session for an adequate supply, and we congratulate the town upon the approaching improvement in its condition. A Leeds correspondent has furnished us with some curious particulars concerning the project, and the Minutes of Evidence before the House of Commons, which are very entertaining. We shall in our next give particulars, and describe the scheme.

Great Viaduct now Erecting over the River Wear, near Sunderland.—This magnificent work, which is for the purpose of connecting the great coal field situated on the right bank of the river Wear, with a harbour to be constructed on the river Tyne by means of the Durham Junction, and the Stanhope and Tyne railways, is advancing rapidly under the excellent management of the enterprising and eminent contractors, Messrs. Gibb and Son, of Aberdeen, and is now attracting much notice in the north of England. This viaduct consists of four large and six small arches. The span of the principal arch measures no less than 160 feet, another 144 feet, and the remaining two 100 feet each. The roadway is about 130 feet above the bed of the river, exceeding by several feet the Cartland Craigs Bridge, near Lanark, and the bridge over the water of Leith, near Edinburgh, erected by the same contractors. Besides the height above the level of the river, the foundation of one of the piers is said to be 40 feet below the level of the water, so that the masonry, from the foundations to the top of the parapet, extends to about 170 feet. This viaduct, whether considered with reference to its great altitude, or the span of its principal arches, is well deserving the inspection of those who take an interest in such matters. The arch over the river has been turned without giving the least obstruction to the navigation. The timber required for centering has been very great; in the great arch alone the quantity is said to be 30,000 feet. The best point from which to view this great structure is on the river about 200 yards either up or down the stream.—*Glasgow Herald.*

Southampton Dock Company.—The Directors have entered into a contract with Mr. Burge for the formation of their Western Dock.

Monck-Wearmouth Docks.—The new Wet Dock, on the north side of the Wear, has been opened in due form. The works consist of an inner and outer dock or basin; the one six and the other one acre and a half in extent; but it can be considerably extended at a comparatively trifling expense, and will accommodate about one hundred sail of large ships.

A Lighthouse is about to be built on Ardglass Pier, in the county of Down.

NEW CHURCHES.

[*We shall feel particularly obliged to Architects in the Country, to forward us the particulars of any New Churches that are building, the Number of Sittings, Dimensions on the Plan; if with Galleries, Vaults, Tower, Turret, or Spire; Brick or Stone Building; Architect's Name, and the Cost or Estimate; also similar information of any Public Buildings that are progressing.*]

A new Church is now erecting at Tunbridge Wells, Kent, from designs by T. Brown, Esq., of Greenwich; the style is Saxon-Gothic, and one of the most beautiful specimens of that unique species of architecture. The walls are faced with brick, with stone dressings; the porch and tower of stone. The Church is intended to accommodate 2,000 persons. The expense is estimated at about £8,000.—*C. L. O.*

A new Church is now erecting at Trowbridge, Wiltshire, under the superintendence of A. F. Livesey, Esq., Architect, of Portsmouth. The style is simple Gothic; the plan is a cross, with a tower at the end of the transcept; the building is to be erected of stone, and to accommodate about 1,200 persons. The cost is estimated at £8,200.—*C. L. O.*

Chesterfield.—A new Church is building in Newbold Lane: the first stone was laid early in the spring, by his Grace the Duke of Devonshire; it is of stone, the extreme length being 103 feet, with galleries on each side, and a square tower: the total height is 84 feet; the style is pointed Gothic; it is to contain sittings for 1,000 persons, and it is estimated to cost, including salary to the Clerk, the sum of £3,361. T. Johnson, Esq., is the architect.—*C. Kinder.*

Trinity Church, Ettingshall, Staffordshire, was consecrated August 23, 1837. The church, schools, and parsonage, were erected from designs by Robert Ebbels, Esq., Architect, of Trysull, Wolverhampton. The buildings are so placed as to form three sides of a quadrangle, and have a peculiar and picturesque effect, forming as it were a little colony of itself; and being built over the mines, they are constructed in half timber, braced and framed together as firm as a ship, and painted black and white in the style of the buildings of Henry VIII. and Elizabeth—a rare occurrence, and we believe the only entire church of that construction in the kingdom. The church is entirely free, except four pews, and contains 920 sittings, including children. There are two tier of galleries at the west end, and the timbers of the roof are shewn and made ornamental, and the whole has a most pleasing effect. The contract for this church alone was £1230.

St. John's Church, Reading, Berks, was consecrated April 28, 1837. It is a Gothic building, the west end of Bath stone, and similar in design to King's College Chapel, Cambridge, with a splendid west window, open battlements, &c. This church contains 897 sittings, 459 of which are free. It was built at the sole expense of the Rev. N. Trench, and the church *alone* cost about £2600. Robert Ebbels, Esq., Architect.

St. Catharine's Church, Ventnor, Isle of Wight, was consecrated July 20, 1837. It is a Gothic building, entirely of stone, and has a most elegant tower and spire, and the interior is extremely chaste. It contains 505 sittings, 179 of which are free. It was built and endowed at the sole expense of John Hambrough, Esq., of Steephill Castle, Ventnor, at a cost of about £3371, *all* expences included. Robert Ebbels, Esq., Architect.

J. Hambrough, Esq. is also having built at his own cost, about £1500, a parsonage-house, in character with the style of the church, from designs by Robert Ebbels, Esq.

July 28, 1837, the corner-stone for a new church at Hawley-Yately, Hants, was laid by Mrs. Dumbleton. This is a small Gothic church, will contain about 320, and one-third of which will be free. It will be ready for consecration *early* this month, December. Robert Ebbels, Esq., Architect.

St. Nicholas Church, Guildford, Surrey. This church was consecrated August 31, 1837. It is a Gothic building, with tower, crocketed pinnacles, &c., the interior shows the timbers of the roof, which are filled in with rich tracery. The church will contain about 1100 sittings, one half free. Cost of church alone about £2500. Robert Ebbels, Esq., Architect.

The church of Enhurst, Surrey, is rebuilding from designs by Robert Ebbels, Esq., Architect.

A new church, Gothic style, tower, &c. is to be commenced immediately at Handsworth, Birmingham, which will contain about 1100 persons, one half to be free. Robert Ebbels, Esq., Architect.

A new Church, Gothic, with tower, &c. is to be commenced immediately (under her Majesty's commissioners), at Tipton, Staffordshire, will contain 1820 sittings. Robert Ebbels, Esq., Architect.

New Church, Lower Rotherhithe.—Holy Trinity. The foundation stone for this Church (being the second of the three churches intended in this extensive parish) was laid October 12. Sampson Kempthorne, Esq., Architect.

Dacre Church, County York.—A new Church has been erected from a plan modelled and designed by a young lady of the neighbourhood.

Barrowfield, Lancashire.—A new Church is about to be erected by subscription.

Clevedon, Somersetshire.—A new Church is to be erected by subscription.

The New Roman Catholic Church in Kendal was opened on the 16th Sept., 1837; it is dedicated to the Holy Trinity. The church is erected in the New Road, and is from the design of Mr. Webster, Architect, of Kendal. It is a fine specimen of the good taste of that talented artist, built in the early Gothic style of architecture. The east front, facing the river, which, to suit the locality of the situation, is the principal entrance, consists of a projecting centre and two receding sides. In the centre is a beautiful doorway, with Gothic columns, and deep moulded arch. Above is an elegant three-light Gothic window, having a neat label and string mouldings, with shields, &c. In the embattled gable there is a handsome niche, canopied, and containing a sculptured limestone group of St. George slaying the Dragon, carved by Mr. Thos. Duckett of this town, a young man rising rapidly into eminence in his profession. The top of the gable finishes with a stone cross. At the extreme angles are projecting octagon buttresses, finished with pinnacles. The receding sides finish at the angles with double square buttresses and handsome moulded caps, and, like the centre ones, surmounted with pinnacles and finials. The ends of all the windows and door labels are finished with carved heads and bosses. The whole of this front is of limestone ashlar. The edifice is a beautiful object from all parts on the east and south sides of the town. The other fronts of the chapel, which are, in a great measure, concealed by other buildings, are of a coarser description, but at the same time neat and substantial.—*The Interior.* The principal entrance leads into a vestibule which connects this entrance with both the body of the chapel and the gallery. On leaving the vestibule, the eye is immediately attracted by the altarpiece at the further end of the chapel, which is a beautiful piece of workmanship. The altar is situated upon a flight of steps, under an archway or alcove. This archway is composed of thirteen columns and rib-mouldings, whilst the intermediate spaces are filled with rich tracery, niches, &c. &c. The archway, in front, is finished with crocketed label and finials, flanked with columns, niches, pediments, and crocketed pinnacle finials. At the back of the alcove rises a handsome and well-executed stained-glass window with three lights, which throws a sombre, but yet suitable light upon the altar, tabernacle, and screen. On each side of the tabernacle there are six niches canopied, in which are placed figures of angels with hands joined in the attitude of prayer. The ceiling is in perfect keeping with what we have described. It displays tasteful work, and is covered at the intersections of the mouldings with bosses, &c. Large pendants hang from the centre, and the effect is magnificent. The walls are stuccoed in imitation of stone, with ornamental label to the windows. At the west end there is an

organ of very large dimensions, built by Mr. John Davis, of Liverpool. As a whole, the interior of this edifice may be considered as a first-rate work of art, and will no doubt secure the admiration of all who have an opportunity of examining it. It is calculated to accommodate from 600 to 700 people, and will cost about £2,500.

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BUILDINGS AND PUBLIC IMPROVEMENTS.

Malibran.—M. Beriot's Monument to Malibran in the cemetery at Laken, as designed by Geef, is described to be a rectangular chapel, surmounted by a cupola and cross. A single door is to admit the light of day to penetrate the interior. A fountain is also mentioned; and the vision of the spectator will only catch an indistinct and mysterious view of a pure marble statue of Malibran, as she appeared in the 5th act of "Norma,' after she had cast off the Royal mantle, and stood with a poetic expression of exaltation and grief, in garments of white.—*Literary Gazette.*

Oxford.—New Courts of Justice are about to be built under the direction of —— Ploughman, Esq., Architect, the successful competitor.

Derby.—A spacious Literary and Scientific Institution, to be called the Athenæum, together with an extensive Hotel, is about to be built under the direction of —— Wallace, Esq., Architect, the successful competitor.

New Street from Holborn-bridge, opposite Farringdon-street, to Clerkenwell-green.—Notices have been given, that an application will be made to Parliament in the present session, for an act to authorise the City authorities to form the above street.

New Street from the New Houses of Parliament to Pimlico.—Notices have been given by order of the Commissioners of Her Majesty's Woods, &c., that an application will be made in the present session for an act to form the above street.

Carriage Paving.—A new method is being adopted on the ascent from Tooley-street to London-bridge; the granite paving is laid in parallel courses with an interstice of two inches between, which is filled up within two inches of the top with two-inch slates, thereby leaving parallel grooves two inches wide and two inches deep, which it is supposed will give the horses a firmer foot hold

THE ELECTRIC TELEGRAPH

A MODEL to illustrate the nature and powers of this machine was exhibited on Wednesday evening, 15th November, at a very full meeting of the Society of Arts (Edinburgh), Sir John Graham Dalyell in the chair. Accidental circumstances prevented us from being present, but we have since had an opportunity of examining it, and seeing it in operation The model consists of a wooden chest about five feet long, three feet wide, three feet deep at the one end, and one foot at the other. The width and depth in this model are those which would probably be found suitable in a working machine, but it will be understood that the length in the machine may be a hundred or a thousand miles, and is limited to five feet in the model merely for convenience. Thirty copper wires extend from end to end of the chest, and are kept apart from each other. At one end (which, for distinction's sake, we shall call the *south* end) they are fastened to a horizontal line of wooden keys, precisely similar to those of a piano-forte; at the other, or *north* end, they terminate close to thirty small apertures equally distributed in six rows of five each, over a screen of three feet square which forms the end of the chest. Under these apertures on the outside, are painted in black paint upon a white ground, the 26 letters of the alphabet, with the necessary points, the colon, semicolon, and full point, and an asterisk to denote the termination of a word. The letters occupy spaces about an inch square The wooden keys at the other end have also the letters of the alphabet painted on them in the usual order. The wires serve merely for communication, and we shall now describe the apparatus by which they work.

This consists at the south end of a pair of plates, zinc and copper, forming a galvanic trough, placed under the keys, and at the *north* end of 30 steel magnets, about four inches long, placed close behind the letters painted on the screen The magnets move horizontally on axes, and are poised within a flat ring of copper wire, formed of the ends of the communicating wires. On their north ends they carry small square bits of black paper, which project in front of the screen, and serve as *opercula or covers* to conceal the letters. When any wire is put in communication with the trough at the south end, the galvanic influence is instantly transmitted to the north end; and in accordance with a well-known law discovered by Oersted, the magnet at the end of that wire instantly turns round to the right or left, bearing with it the *operculum* of black paper, and unveiling a letter. When the key A, for instance, is pressed down with the finger at the south end, the wire attached to it is immediately put in communication with the trough; and at the same instant the letter A at the north end is unveiled, by the magnet turning to the right, and with drawing the *operculum.* When the finger is removed from the key, it springs back to its place; the communication with the trough ceases; the magnet resumes its position, and the letter is again covered.

Thus by pressing down with the finger, in succession, the keys corresponding to any word or name, we have the letters forming that word or name exhibited at the other end—the name VICTORIA for instance, which was the maiden effort of the Telegraph on Wednesday evening. In the same way, we may transmit a communication of any length, using an asterisk or cross, to mark the division of one word from another, and the comma, semicolon, or full point, to mark breaks in a sentence, or its close. No proper experiment was made while we were present, to determine the time necessary for this species of communication; but we have reason to believe, that the letters might be exhibited almost as rapidly as a compositor could set them up in types. Even one-half or one-third of this speed, however, would answer perfectly well.

Galvanism, it is well known, requires a complete circuit for its operation. You must not only carry a wire to the place you mean to communicate with, but you must bring it back again to the trough. Aware of this, our first impression was that each letter and mark would require two wires, and the machine in these circumstances having 60 wires instead of 30, its bulk and the complication of its parts would have been much increased. This difficulty has been obviated, however, by a simple and happy contrivance. Instead of the *return* wires extending from the magnet back to the keys, they are cut short at the distance of three inches from the magnet, and all join a transverse copper rod, from which a single wire passes back to the trough, and serves for the whole letters. The Telegraph, in this way, requires only 31 wires We may also mention, that the communication between the keys and the trough is made by a long narrow basin filled with mercury, into which the end of the wire is plunged when the key is pressed down with the finger.

The Telegraph, thus constructed, operates with ease and accuracy, as many gentlemen can witness. The term *model*, which we have employed, is in some respects a misnomer. It is the actual machine, with all its essential parts, and merely circumscribed as to *length* by the necessity of keeping it in a room of limited dimensions. While many are laying claim to the invention, to Mr. Alexander belongs the honour of first following out the principle into all its details, meeting every difficulty, completing a definite plan, and showing it in operation. About twenty gentlemen, including some of the most eminent men of science in Edinburgh, have subscribed a memorial stating their high opinion of the merits of the invention, and expressing their readiness to act as a committee for conducting experiments upon a greater scale, in order fully to test its practicability This ought to be a public concern. A machine which would repeat in Edinburgh words spoken in London, three or four minutes after they were uttered, and continue the communication for any length of time, by night or by day, and with the rapidity which has been described—such a machine reveals a new power, whose stupendous effects upon society no effort of the most vigorous imagination can anticipate.—*Scotsman.*

MISCELLANEA.

Antiquities of the Crimea.—During the last year the workmen employed in making excavations in the environs of Kertch, made some important discoveries Near the village [illegible]limsche two monuments were found, one of which appears to be seven centuries older than the other. The tomb, which is comparatively modern, contained a sarcophagus in marble, which was surrounded by valuable objects. Among them is a sort of altarpiece in marble, of a square form, and ornamented with a beautiful relief, representing a disciple of Bacchus, a silver sceptre, a gilt wooden bobbin-needle, the remains of a bridle, the bit of which is silver, and a woman's mask in gold, of the usual size, which was placed upon the body of the buried person. There were also several vases in bronze, silver, and gold; and to judge by the Greek letters inscribed upon one of the silver vases, it would appear that this sarcophagus was the sepulchre of the wife of a king Reskoreporis Several sovereigns of that name reigned at Panticapée. The other monument, which is of a much more ancient date, contained a sort of brick enclosure, in which was found a vase of clay, containing ashes and burnt bones. The vase is of a very elegant form, and is likely to excite attention from the beautiful drawings upon it. There are—an Amazon on horseback attacking, lance in hand, two warriors on foot, one of which has a helmet, and the other a Phrygian cap. On no other vase previously found in Taurida has there been seen any representation of a similar subject, and this circumstance adds to its value. The horse of the Amazon is white, although the rest of the drawing is red upon a black ground, and this variety of colours is very rare upon Greek vases. The Amazon is not dressed in the costume usually given to female warriors by the artists who lived in the time of Pericles. The style of the drawing altogether gives rise to the supposition, that it dates from the time of Panticapée, that is to say, the fourth or fifth century before Jesus Christ.—*Hague Journal.*

Dr. Clanney's Improved Telegraph —No machine for making signals or numerical symbols can, with propriety, be called a Telegraph, unless it be adapted to express a sufficient number of letters, so as to form words, not only in one, but also in every written language, and by which words and sentences may be formed expeditiously. We have much pleasure in stating to our readers, that Dr. Clanney, of Sunderland, has so improved his Telegraph, that the advantages hinted at above are now completed, and at the trifling expense of fifty shillings for each station, if the station be ten or even twenty miles. This Telegraph is not to be patented.—*Newcastle Journal.*

OFFICE FOR SCIENTIFIC MODELS, PLANS, SECTIONS, &C., LIKELY TO COME BEFORE PARLIAMENT.—There has never yet been a common centre where plans and models might be seen and examined before each is deposited in the Private Bill Office, to be brought formally before Parliament. This has been felt to be a serious inconvenience. Improvements which might be made in the first instance, and alterations to meet the views of the members who take charge of the several matters in the house of the legislature (both of which have afterwards to be effected often at an enormous cost of money and time), have been prevented from the want of a common centre In order to supply this *desideratum*, Mr Northhouse, Parliamentary Agent, at the request of several scientific men, has permitted a room in his offices in Parliament-street to be devoted to the purpose of exhibiting plans, sections, models, &c, connected with public improvements, likely to come before Parliament.

TO CORRESPONDENTS, AND NOTICES.

We have to express our thanks for the numerous Communications which we have received, some of which we are compelled to postpone until our next Number.

To "Fair Play," and the other Brighton Railway correspondents, we beg to inform them, that it is not our wish to act as partisans: the few remarks we made in our last Number, regarding the Brighton Railway, we scarcely thought could be construed into partiality. We cannot comply with "Fair Play's" request, "to give our own views on the subject;" we wish to see the promised Report of the Engineers of the Direct Line, before we give any decided opinion on any of the contending Lines

We shall be happy to hear from our correspondent *———*.

In our next Number will be reviewed—Reply to Contrasts, by an Architect—Hopper *v.* Cust—Sectio-Planography, by P. W. Simms, C.E.—Treatise on the Construction of Oblique Arches, by John Hart Mason.

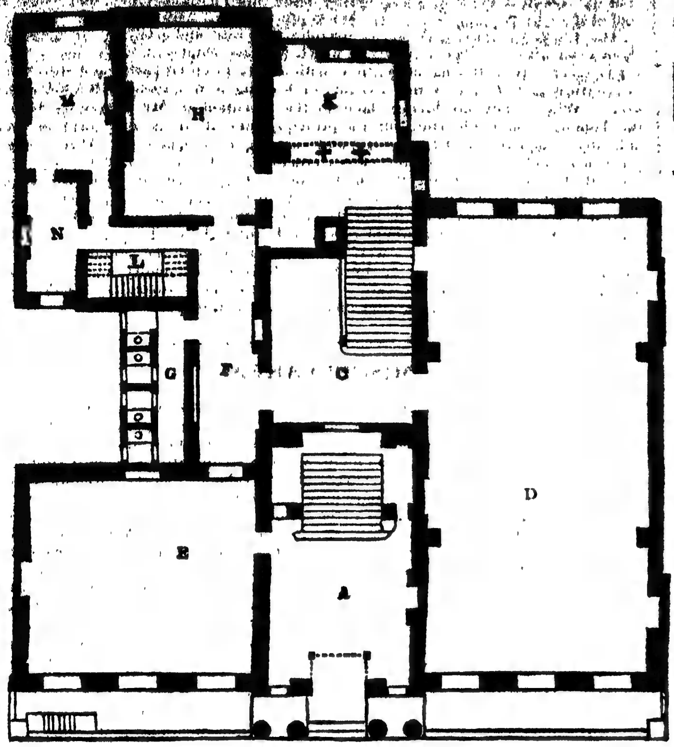
We have made arrangements for a series of papers on Architectural Criticism, by *Ralph Redivivus.* The first paper will appear in our next Number.

The former Numbers, 1 and 2, may be had separately, or stitched together, forming the First Quarterly Part, price 3*s.*; and the next Number will be published as heretofore.

Received a Medal, in bronze, published by Griffin and Hyams, in commemoration of the Queen's visit to the citizens of London. The likeness is good, but the figures on the obverse are bad; we should like to see them obliterated.

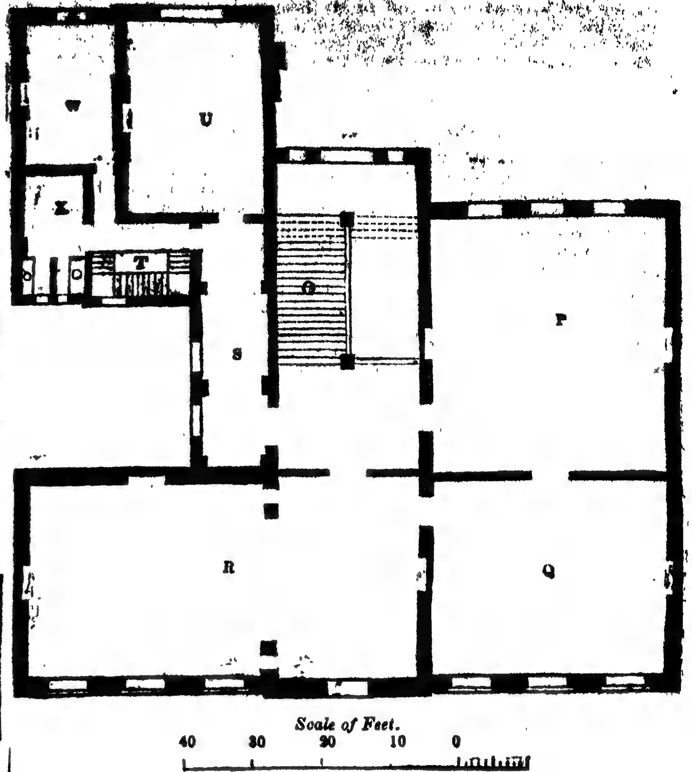
We received as we were going to Press, the "Regulations for Students in Civil Engineering, in the University of Durham, passed by the Senate and Convocation, Nov 22, 1837," which we will notice in our next Number.

PLANS OF THE UNIVERSITY CLUB HOUSE.



GROUND FLOOR.

		Length. Ft. In.		Width. Ft. In.
A	The hall	20 6	by	20 6
B	Stairs.			
C	Principal staircase	40 0	—	39 0
D	Coffee-room	66 3	—	32 4
E	Committee-room	32 4	—	28 2
F	Corridor	34 6	—	9 6
G	Water closets.			
H	House dining-room	28 0	—	19 0
K	Waiters' room.			
L	Stairs to baths, &c.	14 0	—	10 0
M	Secretary's room	20 5	—	12 10
N	Clerk's room	16 7	—	7 8



ONE PAIR.

		Length. Ft. In.		Width. Ft. In.
O	Grand staircase.			
P	Library	37 0	by	32 4
Q	Writing room	32 4	—	28 0
R	Evening room	54 6	—	28 0
S	Corridor	34 6	—	9 6
T	Staircase to billiard-rooms, &c.	14 0	—	10 0
U	Committee room.			
W	Waiters' room	28 0	—	19 0
X	Lobby and water-closets.			

In a former Journal (No. 2, page 15) we gave a drawing of the elevation, and description of the exterior; we now, agreeable to our promise, give the plans of the two principal floors, which are drawn to one half the scale of the elevation.

The hall A is entered through a Corinthian portico of four columns and a small lobby (with Spanish mahogany doors); it is lofty, but rather limited on plan. The principal floor is approached by a wide flight of stone steps, through mahogany folding doors, and on each side are square detached antæ, which, with the walls, are painted and shaded in imitation of stone. On the right is the spacious coffee-room, on each side are two square antæ of scagliola, in imitation of red granite, with enriched bronzed caps, and statuary marble bases, supporting enriched consoles and entablature or cornice, which returns round and divides the ceiling into three large compartments, the middle one being largest; in the centre of each is a very chaste water-leaf flower, of *papier maché*, concealing a ventilator, and surrounded by an enriched rim and honeysuckle border. The walls are divided into panels by an enriched moulding, over a moulded dado. The two chimney-pieces are of black and gold marble, with square panelled antæ, placed on the angle, with entablatures. The wood finishings are grained wainscot, and the walls tinted. The committee-room E is finished somewhat similar to the coffee-room. The waiters' room K is fitted up with hot and other closets, with a shaft communicating with the basement, with apparatus for raising and lowering the dishes, &c. Adjoining is the house dining-room, approached from the grand staircase by a lofty corridor F, which also leads to the secretary's M and clerk's room N, the water-closets G, and back staircase L.

The grand staircase E is ascended by two wide flights of steps, with rail or capping, and turned ballusters, all of stone. The ceiling is divided into compartments, and ornamented with enriched mouldings and pateræ. The walls are painted in imitation of granite.

The evening or drawing-room R is divided into two compartments by Sienna scagliola antæ, with marbled caps and bases, supporting an enriched entablature. The ceiling is divided into panels by a guilloche ornament, the centre of each having a coffer and flower, and the walls are divided into large panels by an enriched moulding. There are two chimney-pieces of statuary marble, having square antæ, with enriched caps, over which are carved the arms of the two Universities. At the east end is a frontispiece, with architrave and consoles for a large plate of silvered glass. The wood-work is excellently painted, in imitation of Russian birch. Communicating with the evening-room is the writing-room and library; the latter contains three ranges of bookcases, occupying the whole of the three sides of the room, the centres having pediments, supported by pilasters; over the two Sienna marble chimney-pieces are large looking-glasses. The door of the writing-room and the bookcases are made of beautiful Russian birch, and the other fittings painted in imitation.

The ceilings of these two rooms are coved, and have an enriched frame and cornice, and a handsome flower in the centre; the walls of the writing-room are panelled.

The windows of the corridor S are of glass, frosted by flouric acid, having a chaste lotus border, and the arms of the two Universities left transparent. At the back is a committee-room, with waiters' room adjoining. On the upper floor there are two billiard-rooms, smoking room, three rooms fitted up with copper-lined baths (supplied with hot and cold water), servants' dormitories, &c. The domestic offices are admirably arranged in the basement and mezzanine stories. The kitchen is 28 feet long and 22 feet wide, with large recesses, containing

an oven, stewing-stoves, &c., which are ventilated above by louvre boards. The range is 6 feet 6 inches long, and has a boiler at the back, containing 100 gallons of water, from which the baths, &c., are supplied. The hot closet is heated by steam from a large boiler behind. A massive elm table, 12 feet by 4 feet 6 inches, and 5 inches thick, with a hot plate in the middle, 6 feet by 1 foot 6 inches (also heated by steam), stands in the centre.

The scullery and housemaids' rooms contain lead-lined troughs, each supplied by hot and cold water (heated in a boiler placed at the back of the stove in the servants' hall). On the mezzanine story are dressing-rooms, butler's pantry, buttery, dispense for wine, steward's, store, housekeeper's, and still rooms; also several marble stands, supplied with hot and cold water for washing.

The ventilation of the large rooms is effected by means of hopper-heads placed over each of the perforated flowers in the ceilings, and conveyed by zinc trunks, 8 feet by 8 inches, through the floors, to flues built in the walls between the smoke flues, by which arrangement the air becomes rarefied and immediately ascends.

The supply of water, for which there are various tanks and cisterns, will be between 4 and 5,000 gallons.

The several works are generally well executed; the rooms are capacious and well arranged; and the whole has more the appearance of convenience than splendour.

ASPHALTIC MASTIC, OR CEMENT OF SEYSSEL.

In the list of Patents in our last Number, will be found one that was granted to "Richard Tappin Claridge, of Salisbury Street, Strand, for a Mastic Cement or Composition, applicable to Paving and Road-making, covering Buildings, and the various purposes to which Cement, Mastic, Lead, Zinc, or Composition are employed." We have, through the kindness of Mr. F. W. Simms, been able to obtain the following particulars:—He was engaged professionally to visit Paris, in October last, to examine the Mastic, try experiments, see the various purposes it had been applied to in Paris, and to report whether it was suitable for the same purposes in this country. After having made a rigid inquiry, and seen several Engineering and Architectural works, where it had been applied, and obtained certificates from several of the most eminent Engineers and Architects in Paris, who highly approved of it, he did not hesitate to recommend its introduction into this country.

In various parts of the eastern chain of the Jura mountains, there are bituminous veins of greater or less extent, but the only place at present known where the asphaltic rock is to be found is at Pyrimont, in the Department de l'Ain. In this immediate vicinity is also obtained a peculiar kind of mineral pitch, there called bitumen, which, upon being mixed in certain proportions with the asphalte, forms the mastic or cement, which in France, after years of struggling with prejudices, and the opposition of parties interested in its failure, is obtaining so large a share of patronage, as to be extensively employed both in the public and private works of that kingdom.

For many years after the discovery of the valuable properties of the asphalte, the mine at Pyrimont was the property of a company of Swiss merchants; but, from their defects of management, and from the limited extent of their finances, their operations were confined within very narrow bounds, and at length languishing, the properties of the mastic was likely to have become lost to society.

The business has now fallen into the hands of a private company at Paris, who, with a capital of thirty thousand pounds, purchased the mine at Pyrimont, and are carrying on an extensive trade in its manufacture.

The asphaltic mastic of Seyssel, when prepared for use, is a compound of two mineral substances, one is the native asphalte, the other is bitumen; the proportion of the former in the amalgam is ninety-three centimes, and of the latter seven centimes. The asphalte is extracted from the mine in blocks, and reduced to an almost impalpable powder before it is mixed with the bitumen. The latter, as extracted from the mine, is first broken into pieces of about the size of an egg, these are put into boiling water, and the particles which rise to the surface are purified by boiling for twenty-four hours; the result is, the bitumen to be mixed with the pulverized asphalte. The combination of these two substances form the mastic or cement, which being reduced to a fluid state by the application of caloric, is poured into moulds of any shape required; or in this state used as cement in hydraulic works, &c. The use of the bitumen appears to be the giving of ductility to the mastic; and if a very minute quantity of sulphur be added, the mastic will become hard and partially brittle.

The genuine mastic possesses the hardness of stone, and yet preserves a certain elasticity. When used as pavement for terraces or footpaths, it appears to resist the wear equally well with granite, and when prepared in the manner now adopted in Paris, it is difficult to distinguish it in such situations from that stone. One of the finest specimens of paving, and which at first sight has the appearance of granite, is that on the north side of the palace and gardens of the Tuilleries; it is about eleven hundred yards in length, and ten feet wide; it is composed of the asphaltic mastic, and the joints which traversely cross it the whole breadth, and which at present appear to divide the pavement into a number of large equally-sized slabs, are disappearing by the mastic becoming more dense from the tramping of feet, so that this extensive piece of pavement will soon appear from end to end, like one immense sheet of stone.

A few minutes after the mastic has been spread in a fluid state, it again takes its natural density, which is such, that at the heat of 30° Reaumer (equal to 100° of Fahrenheit), it resists all impressions from an ordinary force. Its extensive application to the *covering of buildings instead of tiles, slate, or lead* have induced the trial of experiments in France, by which it was ascertained that it is anti-electric, a property which it is desirable that all bodies should possess that are employed in roofing. Its application also for the flooring of halls, passages, and apartments, is in no way dangerous on account of fire, as it is not inflammable, the quantity of pitch which it contains being so very small. For the floors of underground kitchens, &c., it is particularly applicable, it being warm, and keeps out all damp, as well as vermin and insects which are frequently so abundant in such places. When employed in the construction of water-tanks or reservoirs, it imparts neither taste, smell, nor colour to the water it contains.

The following are the retail prices of this material, both in its native and manufactured states, as charged by the company in Paris:—

	£	s.	d.
Asphalte in its native state, per 100 killograms (220 pounds English)	1	0	10
Foot pavements, &c. &c. per metre superficial (1,196 square yards English)	0	5	10
Covering of roofs, per metre superficial	0	7	6

Which gives for foot-pavements ABOUT $6\frac{1}{4}d.$ per square foot, and for roof $8\frac{1}{4}d.$ per square foot.

Preparations are now making for applying the asphaltic mastic of Seyssel on a part of the Greenwich Railway, with a view to preserve the arches of that extensive viaduct free from damp. Also as foot-pavement in several of the metropolitan parishes; and in one of the principal streets of Liverpool, &c. The British public will therefore soon have an opportunity of judging for themselves, of the utility of a material which is held in such high estimation by their continental neighbours.

The introduction of this substance into this country is due to R. T. Claridge, Esq., a gentleman who has spent much time on the Continent, and who has obtained from the company at Paris a contract, whereby they agree to supply this country with the produce of their mine at Pyrimont, through *him only*.

We shall conclude our subject with extracts from the "*Bulletin de la Société Géologique de France*," vol. viii. p. 138. *Communicated by* M. ROZET, *March 7th*, 1836.

"The mastic of asphalte is employed for covering terraces, roofs of buildings, footpaths of bridges and streets, arches, cellars, and interior areas, &c. Also in the construction of aqueducts, basins, and of all kind of hydraulic works. It has been used to cement stones, bricks, and even metals.

"Many works have been executed in Paris and its environs with the mastic of Seyssel; for instance, the footpath on the Pont Royal, and that of the Louvre; trials which have so well succeeded, that the authorities of the city have decided to adopt the same material for the footpaths of the streets, also of the Place de la Concorde, (formerly called Place Louis XV.) which is about to be laid out on an extensive and grand scale. . .

"The magazine of provision at Bercy has been covered for upwards of a year with this mastic, and succeeds perfectly.

"In the years 1832, 33, 34, this mastic was with equal success employed in the construction of the military works at Vincennes.

"It has also been successfully employed in the military constructions at Douai, Besançon, Bourbonne-les-Bains, Grenoble, and Lyons. In the last city, all the covering of roofs and the interior areas of the new forts have been constructed with it. . .

"More than forty years ago, at Fort l'Ecluse, a small building was covered with this mastic, which has ever since continued in a perfect state of repair.

"The asphaltic mastic, the nature of which now begins to be generally understood, will render peculiar advantages in architectural constructions."

REVIEWS.

WELBY PUGIN AND HIS CRITICS.

A Reply to Observations which appeared in Fraser's Magazine, for March, 1837, *on a Work entitled "Contrasts."* By the Author of that Publication. London, 1837.

Reply to "Contrasts," by A. Welby Pugin. By an Architect. London, 1837.

An Apology for a Work entitled "Contrasts," being a Defence of the Assertions advanced in that Publication, against the various Attacks lately made upon it. By A. WELBY PUGIN. Birmingham, 1837.

IN evil hour for himself, and with ill-advised pen, did Mr. Welby Pugin betake himself to the task of writing his "Contrasts;" though, if, as we cannot help suspecting, he was prompted to it by the desire of distinguishing himself, it has certainly answered his views, by having secured for him a marked degree of notoriety. Those who know any thing whatever of that work, require not to be told that it manifests excessive bitterness, both towards his brother Architects, and the Protestant Church; and that so far from partaking of the *suaviter in modo*, the offensiveness of the remarks themselves is greatly increased by that of the imperious tone he assumes, on the one hand, and the sneering, not to say coarse and burlesque satire, in which he indulges on the other, and not least of all, in his frontispieces and other illustrations. We give him all due credit, however, for boldness and fearlessly speaking out his sentiments, notwithstanding that they are the very reverse of flattering, nay, absolutely unpalatable to that class of persons who would be purchasers and readers of his book. Instead of appealing to their prejudices, their sympathies, or their interests—in-

stead of cajoling them by any of that nauseating palaver which can be gulped down only along with the wine at a public dinner, he rails at them in good set terms.

Such being the case, he ought to have made up his mind beforehand to endure with resignation, with valorous patience, all the buffeting he would meet with in return. If we may believe him, he was well aware that he was engaging in a very perilous enterprise; for he says in his "Apology"—"When I determined on publishing my work of 'Contrasts,' I was fully prepared for all the censure that has been, or may be passed upon me, for venturing on so bold an attempt." Yet no sooner was the work reviewed at length—which was not until nearly a twelvemonth after its first appearance, for at first it seems to have been sent to Coventry by the critics—than he began to cry out lustily, and to show himself the most sensitive and thin-skinned of mortals. Instead of feeling grateful towards the writer in "Fraser's Magazine"—though perhaps he really did feel so at heart—for pushing him conspicuously into notice, by giving him and his book a place in the "Batch of Architects," he pretended to be aggrieved, and published a querulous reply, asserting that his work had been "reviewed in a manner calculated to be extremely injurious to his reputation."

Poor man! Greatly injured Welby! Certainly it is exceedingly hard, that after traducing the whole of the profession generally, and many of the chief members in it by name, holding up their works to scorn and derision, and endeavouring to make it appear that architecture has been uniformly retrograding among us, and that it is now almost at its very lowest ebb—it is exceedingly hard, we repeat, that after "reviewing" the productions of so many living architects, "in a manner calculated to be extremely injurious to their reputation," you yourself should be treated with equal freedom. The fortitude with which he had armed himself at the outset, must surely have all oozed away, when he exhibited so much wincing as soon as he felt the lash. It having been intimated to him, it seems, that a reply would most probably draw down upon him a more severe castigation than that he had received in the "Batch"—of which it may be said *castigat ridendo*—he assures the critic, at least the publisher, that "he is greatly deceived if he imagines he is to be bullied or terrified into silence." Now, as to *bullying*, most people will think the author of the "Contrasts" might as well have avoided an expression that others will be apt to apply to himself; for

"*Quis tulerit Gracchos de seditione querentes?*"

Surely nearly all who have read that work will allow, that it contains no little brow-beating and bullying; and that, as if there were to be no appeal from Mr. Pugin's *infallibility*, he boldly passes summary damnation on every modern building, and every modern architect mentioned in it. "Of fierce denunciation," says the writer in Fraser, "there is enough, and more than enough. In the most sweeping and unqualified manner, he, in one brief sentence, gives up to reprobation Buckingham Palace, the National Gallery, the Board of Trade, and the new buildings at the British Museum, declaring that 'no one can look at them, or any of the principal buildings lately erected, but must feel the very existence of such public monuments a national disgrace.' This is not criticism, but the mere strut and swagger of what would fain pass for it."—Most certainly, and as a professional man, it was in some degree incumbent upon Mr. Pugin to adduce some reasons that would have justified his severity; the more so, because, if deserved, it might then have operated as a wholesome caution in future; nor can it be urged by him that such explanation was unnecessary for architectural readers, since, if we are to believe him, all the architects of the present day are ignorant of what constitutes good taste. Even though he omitted criticism in the first instance, he might have supplied the deficiency afterwards in his "Reply" to Fraser; yet, instead of availing himself of the opportunity so offered, he evades it by merely saying, "as touching the New Palace, National Gallery, &c., I am sure that enough detailed criticism had been written on them previous to the publication of my work." We very much question this: however, supposing it really to have been the case, Mr. Pugin might as well have given us satisfactory assurance of it, by referring to the publications where it is to be found, which he now leaves us room to suspect it would puzzle him to do; at least we have not been so fortunate as to meet with any of the *detailed criticisms* he alludes to, except in regard to the first-mentioned building, in the series entitled "Strictures on Structures," which appeared in the "Printing Machine."

That he neither understands nor relishes banter when directed against himself, is evident from the very grave apology he makes for having "let slip the opportunity of introducing St. Marie's Grange, which we understood was designed by himself, by way of contrast to some one of 'the miserable edifices of the present day.' Few will attribute the omission to excess of modesty." His answer is—"In regard to the omission of my own house among the "CONTRASTS," which my reviewer says cannot be attributed to excess of modesty, I beg to say, I am by no means possessed of so large a stock of impudence as he supposes; at any rate, I have too much common sense and feeling of propriety, to exhibit, as an example, a small dwelling, erected with limited means, and simply calculated for a retired residence." Really, after displaying so much of what most persons will consider anything but a feeling of propriety, he shows himself all of a sudden to be strangely scrupulous and delicate. In fact, notwithstanding the reasons he assigns, we cannot help setting down this qualmish feeling of propriety, to the consciousness, that judged by the standard by which he himself has measured the productions of others, his own design would be found remarkably deficient. It is but a lame shuffling excuse, to tell us that his house is "a small dwelling, erected with limited means," because several of the buildings he so severely reprobates, have, in regard to their size, been equally limited as to the funds allowed for them; while, let his residence be ever so small, that circumstance certainly did not hinder him from exhibiting superior taste in it, both in regard to its general style and details, so as to prove by example how much may be made of the most unpromising and limited subject in the hands of a true artist. It is downright shuffling equivocation to allege its size as an apology, because, were it no larger than a cottage or lodge, there might still be considerable effect in it as a design, picturesque outline, tasteful combination of features, and pleasing elegance of forms, if no very great degree of enrichment. At all events, we ourselves have seen things of the kind that have satisfied us far better than what has been upon a much larger scale. There was, besides, one thing greatly in Mr. Pugin's favour, namely, his being his own architect, consequently quite free from all control and interference, and at liberty to act entirely according to his own judgment; which was an advantage not possessed by every one of those whom he so severely takes to task for not having done better. We have therefore our misgivings, and cannot help fancying, that if *weighed in the balance* (*vide* his tail-piece to the "CONTRASTS"), St. Marie's Grange would not be found better than some of the things he has decried. We certainly should like to be better acquainted with this same St. Marie's, respecting which some one has observed, in a manuscript piece, now lying before us,

> "What St. Mary your Marie may be, I know not; yet from your attacks
> Upon the profession, conclude she's no other than St. Mary *Axe*;
> Since chop us, and hew us you do, and preach to us in strain so objurgatory,
> That you'd lead us to Paradise p'rhaps, but first put us all into purgatory!"

Of a truth he is objurgatory enough, and not least of all towards Protestantism, the spirit of which he represents to be utterly inimical to art, and tending to depress all its energies. Whether in his animadversions upon it he speaks without a prompter, or is merely the mouthpiece of some one behind the curtain, we pretend not to judge, and therefore keep our conjectures to ourselves. Yet let his arguments in favour of Popery be his own or not, we think them highly indiscreet in a religious point of view. No one denies that Popery is a splendid form of religion; that many of its ceremonies are gorgeous and impressive, and that it has enlisted the fine arts in its service for the purpose of alluring the multitude, and of securing their allegiance by an imposing display of pomp and authority, and converting devotion into pageantry and *spectacle*. Yet, if we look at all further than mere outward appearances, we shall discover, that in all this there is as much, if not more, of superstition than of piety, on the part of the people; as much zeal for the maintenance of their own authority, as for the honour of God, on that of the priests. We might say, it is not so much the Almighty himself, as the saints, their shrines and relics, which are the objects of Roman Catholic worship, and which have power ascribed to them almost paramount to any other. We desist, however, from touching further upon this head, as being one not exactly suited to the character of our Journal, and shall therefore merely remark, that when Mr. Pugin thinks to plead the cause of the Romish Church, by laying so much stress upon the encouragement it affords to art, he does not show himself a very judicious advocate. Nay, supposing him to be in good earnest, he leaves it to be inferred, that he is ready in all consistency to allow the religions of ancient Egypt and Greece to have been—so far at least—preferable to the Christianity of the Protestant Church; for they likewise were the promoters of architecture and the other arts, in an equal, if not still greater degree than even Popery. So that we are at liberty to imagine, that had the author of the "Contrasts" lived in the times of the first Christians, he would have inveighed against them as barbarous, tasteless iconoclasts, "canting fanatics," and would have moaned over "ruined walls, desecrated shrines, and mutilated images," fallen a prey to the rage of religious innovation. Of consistency, however, he is altogether regardless, otherwise he would not, as he now does, have made his brother architects of the present day chargeable with the deficiencies which, in the same breath, he labours to prove arise out of Protestantism, and are inseparable from it. To one of the two, therefore, he is obviously unjust; and if the truth is, that our national church is peculiarly unfavourable to architecture, the wonder becomes not that our archi-

tects should do no better, but that they actually do as well. It is strange, too, that one who takes so much credit to himself for his candour, should have brought forward any instances at all of church architecture as fair specimens of the state of the art among us at the present day, it being that very branch of it which is least successfully cultivated. Still we need not be very surprised at his doing so, when we find him, with equal fairness and impartiality, culling out St. Pancras Chapel, and some others, as average specimens of the architectural taste of the day.

On the other hand, we will not be quite sure that Popery itself has not much to answer for on the score of corrupting and debasing art, and forcing it into a wrong direction. No doubt it has furnished employment to thousands of artists; but of what kind? Are not its churches like so many manufactories of saints and mothers of God, painted to order? or else lined with horrible representations of martyrdoms, not to mention many subjects, which, if not quite so disgusting, are still more scandalous? And what, we ask, has it done for architecture in any but the Gothic style? In all that regards taste, St. Peter's is the costliest piece of ugliness;—as a work of art, immeasurably inferior to the Pantheon; so that if architecture has anything to do with religion, we must award the palm to the paganism of ancient Rome. And here we may quote, in corroboration of our opinion, what is observed by the "Architect," in his "Reply."

"Where, then, were those glorious sentiments so peculiar, we are told, to the Romish faith, when the buildings of Italy were plastered up and Romanized; when all kinds of mongrel additions were made to the finest and purest of their churches; when, in short, the Gothic cathedral was transformed and degraded into the pseudo-classical hall? There is an utter absence of all sentiment in the frightful additions which the classic architects intruded on the buildings of Italy. England never dreamed of recasing her churches in Roman habits, as in *orthodox* Italy, for an example of which take the church of the Lateran; and any such monstrous absurdity as that with which Jones is chargeable, of tacking a Roman portico to a Gothic cathedral, was no doubt justified in his mind by some such tasteless precedent."

By way of answer to this, Mr. Pugin tells us, that "there was not sufficient zeal existing in this country, after the change of religion, to recase many religious edifices;" and assures us, that the *reformed* clergy had no very great veneration for their cathedrals. That may be; yet wherefore are the Protestants of the present day to be held answerable for the ruthless spoliation of ecclesiastical edifices, committed by their ancestors? It cannot be urged that they are at all insensible to the beauties of the Gothic style, that *very style* whose neglect Mr. Pugin chiefly deplores, since both Protestant England and Germany have done infinitely more for the study of it in our own days, than the whole of Catholic Europe. It is true, we can no longer cultivate the style itself for ecclesiastical purposes, upon the scale and with all the pomp of accessory enrichment required by the Popish service. Consequently, if we err it is in retaining as a model what we must necessarily fall short of, and would therefore, perhaps do better to abandon altogether. Granting Mr. Pugin to be indisputably right in all he asserts, he only convinces us, that if the advancement of the arts among us depends upon Popery, as a *sine qua non* condition, we must leave them to their fate, it being quite useless and labouring against the stream to promote them; because, even should he make proselytes among architects and other artists, and bribe them over to the church of Rome, by the promise of inspiration and genius as the reward of their conversion, that would avail nothing. Rather would it throw all employment in the way of church-building into the hands of those blockheads, as we must suppose them, who still adhered to such a beggarly form of religion as that of Protestantism. Or does he hope to gain over to his cause the whole body of the people of England? Hardly can we imagine *him* to be blockhead enough for that, since it would be attributing to them the utmost enthusiasm for art; whereas, he contends, and the main object of his book is to show, that they have not the slightest feeling for it whatever. The Turks say, that the world rests upon the back of an elephant, but upon what the elephant rests they do not inform us; and it is somewhat after this fashion Mr. Pugin would have our zeal for art lead us to Popery, without telling us where we are at first to get a sufficient stock of it to carry us thither. From our Protestantism it certainly cannot be, since, according to his own showing, that operates upon art nearly as an extinguisher does upon a candle. Altogether it is a most hopeless and helpless affair—so much so, that it is strange Mr. Pugin himself should not have perceived that he had undertaken as fruitless a task, as that of attempting to wash a blackamoor white. In an article in our very first Number we alluded to the one-sided and disingenuous mode adopted by Mr. Pugin, in his "Contrasts," for the express purpose of making it appear—to those at least who trust solely to his representations—that not a single production of modern times will bear the slightest comparison with anything erected in this country previous to the Reformation; since which fatal epoch we have, it would seem, gradually been getting worse and worse. Respecting this kind of candour, the "Architect," too, gives him a rub in the following passage:—

"While he claims to have conducted the comparison with *the greatest candour*, there are many examples chosen of modern works, for which, in fair dealing, others should be substituted. And, first, the church of St. Mary's Redcliffe, Bristol, is contrasted with that of All Souls, Langham Place. Now, really, if he is in want of something very droll and striking, he might instance the church of St. Paul, in the same city; but if anxious only to do justice alike to present or past times, he ought rather to bring forward some such structure as St. Dunstan's in the West—a very fair sample, indeed, of the many churches now building, and whose beautiful interior is well worthy of his inspection. In the same unamiable mood, he contrasts St. Pancras Chapel, London, with Bishop Skirlaw's Chapel, Yorkshire. Now, without leaving the county, we can refer him to one lately built and endowed, at private cost, at Oulton, near Leeds, with every suitable enrichment of stained glass, without any regard to expense—an instance of Protestant devotion by no means of rare occurrence. Equally uncandid is any comparison between Ely House, Dover Street, and Ely Place, Holborn, as examples of the episcopal residences of the nineteenth and sixteenth centuries. In proof of it, we briefly refer him to the restoration which has been effected by the Bishop of Carlisle on Rose Castle, Cumberland; and the additions, though certainly inferior to the former, which have been made by the Archbishop of Canterbury at Lambeth."

No, Welby Pugin is not the man to point to anything that would redound to the credit of any living architect: his patriotism and love of art are made of such strange stuff as to lead him a-hunting in holes and corners after such choice samples as St. Pancras Chapel, while they blindfold his eyes to such buildings as St. Dunstan's in the West, the Hall of Christ Church Hospital, and very many others, both in the metropolis and out of it; for though he published his last pamphlet at Birmingham, he does not seem to have discovered the new Free Grammar School there. So fantastic is the monomania by which he is afflicted, that, unless it disturbs his judgment, merely in regard to architecture, he doubtless insists that a handful of chaff is, to all intents and purposes, a good sample of the wheat—that their shells will serve as well as their kernels to enable us to judge of nuts—and that the quality of wine may be tested from tasting stale bottle drainings! Nevertheless, Mr. Pugin's mode of proceeding is remarkably convenient; and we do not know—we feel half-tempted to adopt it ourselves, and get up a volume of "Contrasts," for the purpose of exhibiting the odd whims, freaks, fancies, and funninesses of Popish architecture, as exemplified in the works of Borromini, and many others, whose genius has been fostered under the all-inspiring influence of the Romish Church. Neither should we despair of being able to show very convincingly, that, miserable and bungling as may be some specimens of pseudo-Gothic produced of late years, there are many buildings—and those not the very best of all which might be selected—that seem nearly perfection when compared with Dance's Gothic at Guildhall. Whether it be because Protestantism has been on the wane in this country since those restorations were made, we pretend not to decide.

But how does Pope Pugin parry the thrust made at him by the Protestant "Architect?" Why, he either overlooked the passage we have quoted altogether, or else entirely forgotten it afterwards; although, as he thought fit to answer his pamphlet at all, he ought on no account to have passed unnoticed what is there said, because it amounts to a charge of blinking stupidity on his part, if not of downright dishonesty. Perhaps he comforts himself by thinking, that, at the worst, he can only be reproached with having acted jesuitically, and that the most unfair treatment is quite good enough for heretics.

It is now time for us to desist; yet we cannot prevail upon ourselves to lay down our pen before informing our readers, that to the "Apology" are appended "Some Observations on the State of the Arts in England; showing that the degraded condition into which art has fallen is owing to the absence of Catholic feeling among its professors the loss of all ecclesiastical patronage, owing to a Protestant church establishment, and the apathy with which a Protestant nation treats the higher branches of Art." It is a pity Mr. Pugin could not show that Protestantism laid an embargo on the Elgin Marbles, and prevented their being imported into this country; and that it smothered every spark of feeling and genius in John Flaxman, many of whose monumental subjects are fraught with such holy energy of conception and sentiment, that, in comparison with them, most things of the same class, by Catholic artists, are little better than theatrical parodies—sometimes profane buffooneries; and surely Mr. Pugin must be antiquarian enough to know, that many of the ornamental carvings in vogue in churches, during the "good old Catholic times," did not bespeak much devotional feeling, being anything but of an edifying nature.

If we may believe the author of "Contrasts," every branch of art is at this moment at the lowest stage of degradation in this country; and, although expressly not named by him, yet, as he makes no direct excep-

tion in their favour, we must suppose he is not inclined to admit any in regard to architectural drawing and engraving. Here, at least, we should have thought he would have found much to approve—to admire—even to extol: but no; the finished truth and exactness, or poetic feeling, given to their subjects by such artists as Mackenzie, Wild, Neale, Cattermole, Roberts, Lewis, and many others, must yield to the loose and incorrect, and equally harsh, delineations of Hollar, whom, we presume, Mr. Pugin has proposed to himself as his model in his rude and almost shapeless scratchings, of which the above-quoted MS. says—

"Your etchings are not quite divine, 'cause, in truth, there's not one in the batch
That does not, for all the world, look as if etched by the hand of *Old Scratch!*"

As for the Annuals, in regard to them he is severe even to bitterness; and here, again, he does not except the "Landscape Annual," whose beautiful architectural subjects might, we think, have mollified and propitiated him. He denounces the Annuals, one and all, as an "everlasting disgrace to the era in which they were manufactured;" and "Books of Beauty, Flowers of Loveliness, Gems of Beauty," &c., as "*absolute trash.*" Really, this is quite awful. When, however, he charges our artists with offending by impure and wanton subjects, in which hardly common decency is observed, his laudable indignation quite overlooks the transgressions of those Catholic painters, Correggio and Titian, whose Ledas, Danaes, and Venuses, certainly come under the description of "women thrown into lascivious positions." Again, we repeat, Mr. Welby Pugin is the most indiscreet advocate we have met with; we suspect that he has never read Salvator Rosa's bitter remarks on the profane subjects tolerated in Catholic churches. Ere long, Mr. Pugin will, perhaps, afford us an opportunity of returning to him again; nay, it is possible that what we have said may be the occasion of his favouring the world with another pamphlet, in which he will hardly fail to call to his assistance the article which appeared in the last number of the "Dublin Review," containing the following more naive than respectful observation: "The 'CONTRASTS' is a book full of life and spirit, and *amusing, though unto sadness*"!!! Truly, a most sad compliment; yet we will not be certain that the last word is not a misprint, and that *madness* was not the word intended; for that there is no little portion of madness in the book is quite indisputable.

Memerials of Cambridge.—No. 2.

[SECOND NOTICE.]

IN our first notice of this work, we spoke of it only in general terms, and chiefly for the purpose of suggesting improvements, that if adopted would give it a decided advantage over the 'Oxford,' without at all interfering with uniformity of plan in the two series. We must now say that we are threatened with a want of uniformity between the two of a totally different nature; for while the same plan is adhered to without any of those changes in it for the better, of which it is susceptible, the execution, we have great reason to fear, will be sadly inferior. Our apprehensions that such will turn out to be the case, are tolerably well justified, by the 'View of Trinity College, from the S.E. angle of the Cloisters,' in this second number; where an architectural subject, by no means the best in itself, is made to appear to the utmost disadvantage, not only by utter want of taste in the mode of showing it, but also by bad drawing, and equally bad engraving. In the drawing, to tameness and want of spirit, are added such indistinctness and incorrectness, that the draughtsman appears to have *fumbled* his way without understanding the architectural forms and character. Indeed, the most prominent objects in the 'View,' are the three gawky gownsmen at the corner of the cloister, who have only two pair of legs and a half among them. What one of them has done with one of his legs, we know not; perhaps he has put it into his pocket; or a still better *perhaps* is, that he has sent it to look after Mr. Le Keux's right-hand, which the latter certainly parted with, when he parted with Mr. Mackenzie. Nay, as for the matter of that, he seems to have parted with the other also, and not to have a hand left. At all events we must suppose that he engraved this plate by proxy, without ever once touching it; a supposition the reverse of uncharitable, since we should otherwise be compelled to say that he cannot now even remind us of what he once was.

To be really kind to Mr. Le Keux, we must be seemingly cruel, and plainly tell him, that when he suffers his name to be affixed to such a miserable production as this print, he is guilty of a double injustice; in the first place towards the public, in the second towards himself and his own reputation. As affects either, it surely is not very fair to palm off, by means of the credit hitherto deservedly attached to Mr. Le Keux's name, what in itself is absolutely disgraceful, and fit only to pass muster in a girl's scrap-book. Let Mr. Le Keux then take our admonition seriously to heart, and beware in good time. There may be limit even to the gullibility of the public, and unless he would open their eyes to the system he is now pursuing, he would act prudently in cancelling the wretched engraving alluded to, not only as discreditable, but as likely to prove highly injurious to the success of the work as a speculation.

A Practical Treatise on Warming Buildings by Hot Water, and an Inquiry into the Laws of Radiant and Conducted Heat; to which are added, Remarks on Ventilation. By CHARLES HOOD, F.R.A.S *Illustrated by numerous Wood-cuts.* London: WHITTAKER & Co. 1837.

THE Author commences his work with a judicious and instructive inquiry into the causes of circulation of water and its consequences; he points out the obstacles which frequently occur either through accident or inefficient apparatus; he then describes the laws which regulate the circulation of hot water, the effect of friction occasioned by water passing through small pipes, the comparative advantages of warming by steam and hot water, the rates of cooling, description of different boilers in use, their advantages and defects, and the relative proportion of the boiler to the pipes, wherein he observes,

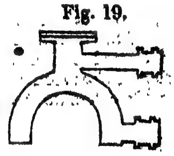
"It is obvious that the extent of surface which a boiler ought to expose to the fire, should be proportional to the quantity of pipe that is required to be heated by it; and it is not difficult to estimate these relative proportions with sufficient accuracy, notwithstanding the various circumstances which modify the effect. Reckoning the surface which a steam boiler exposes to the fire, at 4 square feet, for each cubic foot of water evaporated per hour;* and calculating the latent heat of steam at 1000°; we shall find that the same extent of boiler surface, which would evaporate a cubic foot of water, of the temperature of 52°, into steam, of which the tension is equal to one atmosphere, would supply the requisite heat to 232 feet of pipe, 4 inches diameter, when its temperature is to be kept at 140° above that of the surrounding air. The following proportions for the surface which a boiler for a hot-water apparatus ought to expose to the fire, will be found useful.

Surface of Boiler exposed to the Fire.	4 In. Pipe.	3 In. Pipe.	2 In. Pipe.
$3\frac{1}{2}$ square feet, will heat	200 feet, or	266 feet, or	400 feet.
$5\frac{1}{2}$	300	400	600
7	400	533	800
$8\frac{1}{2}$	500	666	1000
12	700	933	1400
17	1000	1333	2000

"In order to estimate the quantity of surface, which is acted upon by the fire, an allowance must be made for the flues which circulate round the exterior of the boiler. Thus, suppose the boiler, fig. 15, to be 30 inches long, there will be about $8\frac{3}{4}$ square feet of surface exposed to the direct action of the fire; and suppose, also, there are four external flues, one on each side, and two on the top of the boiler, each being 12 inches wide; we may reckon that one-half the effect is produced by these flues, which would have obtained, had the direct action of the fire been employed on the like extent of surface; therefore the flues will be equal to 5 square feet of surface exposed to the *direct* action of the fire, making altogether $13\frac{3}{4}$ square feet as the available heating surface of a boiler of this shape and size. This would be sufficient to heat about 800 feet of pipe 4 inches diameter, when the excess of its temperature above that of the surrounding air is 140°, as before stated. A boiler of the same shape, and 24 inches long, has about 11 square feet of surface, when calculated by the preceding rule; a boiler 36 inches long, has $16\frac{1}{2}$ square feet of surface; and a boiler 42 inches long, has 19 square feet of surface; the increase being directly proportional, in the simple ratio, to the length.

Fig. 15.

Fig. 19.



"A circular boiler 30 inches diameter, like the fig. 19, with a 9-inch circular flue round the outside, will expose, as nearly as possible, the same extent of surface as a boiler 30 inches long of the shape last described, and therefore the one will be as effective as the other. The surface of other sizes of this shaped boiler can be easily calculated; but instead of varying in the simple ratio of the length or diameter, it will be found to be proportional to the *square of the diameter*, so that the proportion of surface increases more rapidly than in the arched boiler. Thus a circular boiler 24 inches diameter, has $8\frac{3}{4}$ square feet of surface exposed to the fire; a 30-inch has $13\frac{3}{4}$ square feet; a 36-inch, $19\frac{3}{4}$ square feet; and a 42-inch, $26\frac{3}{4}$ square feet; the small sizes having less surface, and the large sizes having more, than the arched boilers of the shape of fig. 15."

The Author then proceeds to describe the construction and dimensions of furnaces, and their proportions to the boiler and quantity of pipe to be heated. He next explains the theory and laws of heat which bring us to the experiments made by the author on cooling. Here we must remark, that these experiments are made on such a small scale as to render them very unsatisfactory for any practical purposes, as in the following case:—

* The surface of a steam boiler which it is necessary to expose to the action of the fire, in order to evaporate one cubic foot of water per hour, varies from 2 to 10 square feet, according to the rapidity of the draught, and the intensity of the heat of the furnace. When the very small surfaces are used, mechanical means are requisite for blowing the fire.

"To ascertain by experiment the velocity of cooling, for a surface of cast-iron, I used a pipe 30 inches long, $2\frac{1}{4}$ inches diameter internally, and 3 inches diameter externally: the ends were closed, and the bulb of a thermometer was inserted about 3 inches into the water at one end, the temperature being alike in every part of the pipe. The exposed surface of the pipe was 287·244 square inches, and the quantity of water contained in it was 171·875 cubic inches. The rates of cooling were tried with different states of the surface: first, when it was in the usual state of cast-iron pipes, covered with the brown surface of protoxide of iron; next it was varnished black; and finally, the varnish was scraped off, and the pipe was painted white with two coats of lead paint."

The experiments to ascertain the cooling effect of glass windows are equally unsatisfactory.

"To ascertain the effect of glass windows in cooling the air of a room, the following experiments were made, with a vessel as nearly as possible of the same thickness as ordinary window-glass. The temperature of the room, in these experiments, was 65°; the thickness of the glass was ·0825 of an inch; the surface of the vessel measured 34·296 square inches, and it contained 9·794 cubic inches of water."

Then, again, the remarks on the quantity of heat derived from coal, founded upon the statement of other authors, and the effect which a certain quantity of hot water will produce, is by no means satisfactory. Why not have made a few experiments on different kinds of apparatus that are in use for warming of buildings? Every practical man knows the great difference in the consumption of fuel in various furnaces, and none more so than in the quantity of fuel consumed for heating of water for warming of buildings. To enable our readers to judge for themselves, we make the following extracts from the work:—

"It is stated by Watt, that 1 lb. of coal will raise the temperature of 45 lbs. of water from 55° to 212°. Rumford states, the same quantity of coal will raise $36\frac{8}{10}$ lbs. of water from 32° to 212°; and Dr. Black has estimated that 1 lb. weight of coal will make 48 lbs. of water boil, supposing it previously to be at a mean temperature. These quantities, when reduced to a common standard, vary but little from each other. Watt's experiment of 45 lbs. of water being heated from 55° to 212°, is equal to $39\frac{1}{4}$ lbs. only, if heated from 32° to 212°: and this nearly agrees with Count Rumford's calculation; at least the variation is not more than might be expected from a slight difference in the quality of the coal. Dr. Black's estimate is as much in excess over the experiment of Watt, as Rumford's is in defect; we may, therefore, take the average of these three experiments, which will give as a result, that 39 lbs. of water may be heated from 32° to 212° by 1 lb. of coal.

"To ascertain the effect which a certain quantity of hot water will produce in warming the air of a room, there appears to be no better method than that of computing from the specific heat of gases compared with water.

"Every substance, it has before been observed, has its peculiar specific heat. Now, 1 cubic foot of water by losing 1° of its heat, will raise the temperature of 2990 cubic feet of air, the like extent of 1°; and by losing 10° of its heat, it will raise the temperature of 2990 cubic feet of air 10°, or 29,900 cubic feet 1°, and so on.

"In order to know the time it will take to heat a certain quantity of air, any required number of degrees, by means of hot water contained in metal pipes, we must calculate the effect from direct experiment; and, as the radiating and conducting powers of different substances vary considerably, it is necessary that the experiment be made with the same material as the pipes for which we wish to estimate the effect.

"From the data obtained by experiments on the cooling of iron pipes, it appears that the water contained in a pipe 4 inches diameter, loses ·851 of a degree of heat per minute, when the excess of its temperature is 125° above that of the circumambient air. Therefore (by Art. 140), 1 foot in length of pipe, 4 inches diameter, will heat 222 cubic feet of air 1° per minute, when the difference between the temperature of the pipe and the air is 125°.

"To calculate the quantity of pipe that will be necessary to warm any particular room or building, and to maintain it at the required temperature, the heat lost by the necessary ventilation, and by the conducting and radiating power of the glass, and of any metallic substances used in the building, must be estimated.

"The calculations of the quantity of air required for ventilation, and the method of ventilating buildings, are considered in a subsequent chapter. (Chapter XI.) It is unnecessary, therefore, in this place to pursue the subject further than to state, that, in all public buildings, and rooms of dwelling-houses, a quantity of air equal to $3\frac{1}{2}$ cubic feet for each individual the room contains, must be changed per minute, in order to preserve the wholesomeness and purity of the atmosphere.

"The loss of heat in all buildings having any great extent of glass, we shall find to be very considerable. It appears by experiment, that one square foot of glass will cool 1·279 cubic feet of air as many degrees per minute, as the internal temperature of the room exceeds the temperature of the external air; that is, if the difference between the internal and the external temperature of the room be 30°, then 1·279 cubic feet of air will be cooled 30° by each square foot of glass, or, more correctly, as much heat as is equal to this will be given off by each square foot of glass; for, in reality, a very much larger quantity of air will be affected by the glass, but it will be cooled to a less extent. The real loss of heat from the room will therefore be what is here stated."

From such data do the author deduce the following rule:—

"From the preceding calculations, the following corollary may be drawn:—the quantity of air to be warmed *per minute* in [illegible] buildings, must be $3\frac{1}{2}$ cubic feet for each person the room contains, and $1\frac{1}{4}$ cubic feet for each square foot of glass; and for conservatories, forcing houses, and other buildings of this description, the quantity of air to be warmed *per minute* must be $1\frac{1}{4}$ cubic feet for each square foot of glass which the building contains. When the quantity of air required to be heated has been thus ascertained, the length of pipe which will be necessary may be found by the following

"RULE.—Multiply 125 by the *difference* between the temperature at which the room is proposed to be kept, when at its maximum, and the temperature of the external air; and divide this product by the *difference* between the temperature of the pipes, and the proposed temperature of the room: then, the quotient thus obtained, when multiplied by the number of cubic feet of air to be warmed *per minute*, and this product divided by 222, will give the number of feet in length, of pipe 4 inches diameter, which will produce the desired effect.

"When the pipes which are to be used, are 3 inches diameter, then the number of feet of 4-inch pipe, obtained by this rule, must be multiplied by 1·33, which will give the length of 3-inch pipe: or to obtain the quantity of 2-inch pipe, the length of pipe 4 inches diameter, obtained by the rule, must be multiplied by 2; the length required of 3-inch pipe, being one-third more than 4-inch, and the length of 2-inch pipe being double that of the 4-inch, when the temperatures are the same in all. * * *

"The quantity of coal necessary to supply any determinate length of pipe, is easily ascertained from the data given in Art. 138. After the water in the pipes is heated to its maximum, the quantity of coal consumed is, obviously, just what is required to supply the heat given off from the pipes. Now, by Art. 126 we find, that when pipes, 4 inches diameter, are 146·8° hotter than the air of the room, the water contained in them loses exactly 1° per minute of its heat. By Art. 138 we find that 1 lb. of coal will raise the temperature of 39 lbs. of water 180°; therefore, as 100 feet in length of 4-inch pipe contains exactly 544 lbs. of water, it will require 13·9 lbs. of coal to raise the temperature of this quantity of water 180°. If, therefore, the water loses 1° of heat per minute, or 60° per hour, this quantity of coal will supply 100 feet in length of pipe, for three hours, if its temperature continues constant with regard to the air of the room. * * *

"For estimating the quantity of pipe which is required to warm any building, rules of a much more facile character, though, at the same time, much more loose and inaccurate than those which have been already given, may easily be constructed; but they will answer sufficiently well in many common cases. Thus, in churches and very large public rooms, which have only about an average number of doors and windows, and moderate ventilation, by taking the cubic measurement of the room, and dividing the number thus obtained by 200, the quotient will be *the number of feet in length, of pipe 4 inches diameter*, which will be required to obtain a temperature of about 55° to 58°. For smaller rooms, dwelling-houses, &c., the cubic measurement should be divided by 150, which will give the number of feet of 4-inch pipe. For green-houses, conservatories, and such-like buildings, where the temperature is required to be kept at about 60°, dividing the cubic measurement of the building by 30, will give the required quantity of pipe; and for forcing-houses, where it is desired to keep the temperature at 70° to 75°, we must divide the cubic measurement of the house by 20; but if the temperature be required as high as 75° to 80°, then we must divide by 18, to obtain the number of feet of 4-inch pipe. If the pipes are to be 3 inches diameter, then we must add one-third to the quantity thus obtained; and if 2-inch pipes are to be used, we must take double the length of 4-inch pipe."

Thus it will be perceived not a single calculation is founded upon experiments made upon any apparatus in use. To our mind the only legitimate way of establishing anything like *practical data* to work upon, is to perform a series of experiments upon the different kinds of apparatus in use for warming by hot water; in such case the application of many of the author's calculations would have been serviceable. We trust that he will take an early opportunity of going more deeply into the subject than he has already done, and publish an addenda to his work; if he would perform such a set of experiments as we will point out, the work would then be complete and much more valuable. To obtain the particulars of every method now in use for warming of buildings by hot water, and all the information that can be collected, both from the inventor, and the party under whose care and management the apparatus is kept, to ascertain if it fully answers the purposes intended; carefully inspect the furnace and boiler, and take their dimensions; calculate their respective capacities; ascertain the method of setting the boiler, and length of draught of chimney; how the boiler is supplied with water; the respective situations of the inlet and outlet pipes; the dimensions and lengths of the pipes that are fed from the boiler in each room; the extreme distance of the pipe from the boiler; the relative positions of the pipes, whether the water ascends directly perpendicular, and feeds the pipes on the respective floors by horizontal branches, or otherwise; measure the capacity of each room and surface of glass; ascertain the aspect of each room; number of doors, and if they open into a passage or staircase warmed or not; the relative position of the pipes in each room, and the method adopted for ventilation. After having carefully ascertained all the before-mentioned particulars, then proceed with the experiments. Let the furnace be cleared from any fuel [illegible] in the boiler

and pipes is of the same temperature as the water in the cold water cisterns which supply the premises—then weigh the coals or fuel as it is put in the furnace, note the precise time that the fuel is ignited, and at the same time the temperature of the water in the boiler and pipes, also the temperature of the external and internal atmosphere: if possible, cause the bulb of a thermometer to be let into the boiler and the pipes in the several rooms that are to be warmed, the stalk of the thermometer to pass through an air or water-tight collar; let another thermometer be suspended in the middle of each room; employ several persons to note down every quarter of an hour, simultaneously, commencing at the moment the fire is ignited, the relative temperature of the external and internal atmosphere of every room, the water in the boiler and pipes, also the quantity of fuel consumed; when all these experiments have been made, and after the premises have been properly warmed, rake out the fire, ascertaining up to that time the quantity of fuel consumed, and in a similar manner as before note down the various degrees of heat, until the water be cooled down to the same temperature as at the commencement of the experiments. These experiments ought to be performed when the relative rooms are occupied for the purposes they are generally used for; the number of persons who frequent them should also be ascertained, and likewise if there be any general complaints regarding the ventilation.

Having thus performed experiments upon different systems of warming, and under a variety of circumstances, and in various premises, then endeavour to ascertain if there be any approximation in the relative quantity of fuel consumed to the space heated or ventilated; the cooling effect of glass, doors, &c.; the relative advantages of each system, and also the *cost* of the apparatus. Several other inquiries and experiments might be made, which would suggest themselves to an inquiring mind, and one that is disposed to go into the subject unbiassed, and with spirit and determination.

We have in some measure digressed from the work before us, which we hope our readers will excuse; we will now proceed to describe the remainder of the work. The next chapter is on various modifications of the hot-water apparatus, describing Kewley's Syphon principle, the high-pressure system, Eckstein and Busby's circulator or rotatory float, &c. The author then proceeds to give a general summary of the subject, containing some useful hints and information, which is followed by some judicious remarks *on ventilation*. The concluding chapter is on the different modes of distributing artificial heat, and the effect prodnced by hot-air stoves: at the end of the work there are several useful tables.

Notwithstanding the objections we have made (which are alike applicable to most, if not all other works on the same subject), we consider the work deserving of attention; it contains a great deal of useful information, and the author has taken considerable pains and trouble in the experiments he has performed, which will be found interesting to such persons as are desirous of studying the laws and nature of warming buildings by hot water.

Sectio-Planography. By F. W. Simms, C.E. London: John Weale, 1837.

This pamphlet explains Mr. Macneill's method of laying down railway sections and plans in juxta-position, showing at one view whether the railway passes through any particular property on a level or on an embankment, or in a cutting. To the professional eye it will give a clear view of the nature of the railway, how it will affect any particular property on the line, and the magnitude of the works; it is requisite, so as to make the drawings as clear as possible, that the embankment and cuttings should be coloured two different colours. In the New Standing Orders of the House of Commons of last Parliament, an order was made that all future railway plans should have the section laid down on the line shown in the plans, as recommended by Mr. Macneill, and explained by Mr. Simms in this pamphlet.

Railway Practice. By S. C. Brees, C.E., &c. J. Williams, 1837.

Among the many practical illustrations contained in this work, none are more deserving of attentive consideration than those of the works on the extension line of the London and Birmingham Railway. There is much to study, and a great deal to learn by the engineering student, in this portion of the railway; there are a greater variety of works, for its distance, than any other railway in the world. The designs for the bridge over the Regent's Canal display much ingenuity to overcome the difficulty of want of height for turning an arch over the canal; instead of which, sixteen ponderous transverse girders are obliged to be introduced, suspended to six massive cast-iron segmental ribs, spanning across the canal and towing-path, 50 feet wide in clear of the piers. There has been much judgment displayed in combining a bold architectural character in the design, which is frequently a difficult task to overcome when stone and iron are connected. The whole of the designs and working drawings of this bridge have been condensed into seven plates, which have also the advantage of the Specifications of the works being annexed. The next designs deserving of notice are those of the bridges under Park Street and the Hampstead Road; here, again, the engineer has had considerable difficulties to overcome, on account of want of height to turn arches, and also on account of the connexion of cross streets with the main road, which unite on the top of these bridges. Mr. Stephenson is certainly entitled to the highest praise for the taste he has displayed throughout the work on the London and Birmingham Railway; in no part of the line can he be challenged with having neglected architecture. He has given a character of beauty and simplicity to all his designs, without sacrificing the appearance of solidity and strength; there is no frivolity, or cutting up into small parts, nor appearance of weakness; every part clearly shows the duty it has to perform, and that nothing superfluous has been introduced, which is the beauty of architecture. Among the other drawings of the Birmingham Railway which are interesting and instructive, are those showing the method of working the Primrose Hill Tunnel: we regret that the editor has not given descriptive particulars of the working as well as the drawing. We have neither time nor space to go more fully into the work; but we will again avail ourselves of doing so the first opportunity.

A Practical Treatise on the Construction of Oblique Arches. By John Hart. Mason.

This is a treatise with several drawings, describing the method of cutting the stone, and setting oblique or skew arches, which the author has done in a very satisfactory manner. We recommend the work to the profession, contractors, and others connected with railways.

A Letter to H.R.H. the Duke of Sussex, with a Plan for the Promotion of Arts, Science, and Literature, by the moderate but effectual Assistance of Government. By Thomas L. Donaldson, Architect, F.R.I.B.A. London: J. Williams, 1838.

It is unnecessary for us to say much regarding this pamphlet; we cordially agree with its remarks relative to the heavy expenses incurred by scientific societies for rent and taxes, independent of other charges; we sincerely hope that Mr. Donaldson's efforts in calling the attention of the Government and the public to the subject will prove beneficial; it cannot be in better hands than the author's. We make the following extracts from the judicious remarks and suggestions contained in this pamphlet.

"The efficiency of many of those associations is much restricted by the limited means which they have at command. Those, which offer matters of general interest within the reach of the Dilettante and Amateur, as the Antiquarian, Geological, Horticultural, and Zoological Societies, may gather within their ranks as members a sufficient number of the lovers of each peculiar study, so as to acquire an income to meet their necessary expenses. But there are others, more strictly professional, such as the Institution of Civil Engineers, the Institute of British Architects, the Astronomical and Medical Societies, less attractive to non-professional members, and consequently not possessing that numerical strength which can enable them to establish an income adequate to the expenditure necessarily incurred by the house rent, the salaries of officers and servants, the institution of lectures and experiments, the collection of a library and museum, and the printing and other requisite disbursements, without which no society for the promotion of science can be effective. Besides, it is not fair that those who devote their time and professional experience to promote the purposes of such a society, should be further taxed in order to provide the entire pecuniary means to which reference has just been made. The very love of science induces them to come forward as they do; for it cannot be suspected for a moment, that affiliation to any association could add to the reputation of those men, from whose talents and zeal the chief advantages of such associations are derived. * * *

"The following table will show the average fixed income of several societies at the present period, resulting from the subscriptions and other contributions, and from the dividends:—

Names of Societies.	Annual Subscriptions.	Compositions.	Admission Fees or first year's additional Contributions.	Arrears.	Dividends.	Total.	Rent.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Royal Astronomical	172 0 0	42 0 0	38 0 0	43 0 0	65 0 0	360 0 0	105 0 0
Royal Geographical	416 0 0	323 0 0	117 0 0	48 0 0	168 0 0	1072 0 0	110 0 0
Royal Asiatic	488 0 0	478 0 0	68 0 0	15 0 0	58 0 0	1107 0 0	255 0 0
R. Med. & Chirurg.	466 0 0	....	202 0 0	....	....	668 0 0	210 0 0
Ins. Civil Engineers	483 0 0	....	....	....	69 0 0	552 0 0	108 0 0
R. Society Literature	439 0 0	....	....	....	8 0 0	447 0 0	228 0 0
Statistical Society	615 0 0	57 0 0	....	....	42 0 0	714 0 0	184 0 0
R. I. Bri. Architects	253 0 0	168 0 0	41 0 0	....	33 0 0	495 0 0	200 0 0

"The expense which is incurred by these societies in the rent for apartments affording accommodation quite inadequate to their wants, and, in many cases, in situations most inconvenient for their operations, weighs like an incubus, [illegible] at their first formation they are obliged to be satisfied with any apartments, however insufficient, in order not to incur too serious a rental. Some societies want but little accommodation, requiring only a mere meeting-room, ante-room, and library; but to others a museum also, and other apartments, are necessary. Still, in all cases, the rent presses most heavily.

"I would, therefore, venture to suggest, that Government could afford assistance to such Associations, at once effectual and little liable to abuse, by locating them suitably; in fact, by extending to other Societies that privilege which is now peculiar to the Royal Society, Antiquarian, Geological, and Astronomical Societies, and the Royal Academy of Arts. By this means their funds would be relieved from a material item of expense; and the fact of being in an edifice provided by Government, and as it were carrying on their proceedings with its immediate sanction, would give them a weight and importance, which no other method could produce so effectually or so unobjectionably.

"I should, in addition, suggest that Government should continue to afford those facilities for making important experiments, which it has hitherto granted at Woolwich and other public establishments, where the machinery and instruments at command are of that power, variety, and extent, which it is impossible for individuals, or Societies even, to possess."

Blunt's Civil Engineer and Practical Machinist. By CHARLES JOHN BLUNT, Esq. *Division B., Plates with Book.* London: Ackermann and Co.

WE are glad to see another part of this excellent work, which has many advantages over others of a similar description. In consequence of it being published on a large scale, all the plates are engraved from the original drawings of the engineer, without any reduction, thereby enabling any manufacturer or workman to understand them, and in many cases will save the necessity of making other drawings. The present part contains several important drawings, among which is the Lawley Street Viaduct, on the London and Birmingham Railway, together with the Specification of the work. There are also the drawings of the famous six-wheel "Bogie" locomotive engine and tender, manufactured by Messrs. Stephenson for the London and Birmingham Railway, and a similar engine, "The Hercules," manufactured by Mr. George Stephenson for the Newcastle and Carlisle Railway; also drawings of the Goods Waggons, with all their details, beautifully engraved and delineated. The last plate contains the drawings of the Maidenhead Bridge, on the Great Western Railway Line.

We hope the proprietors will proceed with the publication of the work with regularity, and produce one part, at least, every three months; we are sure the work will succeed if they will do so.

An engraved View of the Interior of the Chancel of Stratford Church, (the Mausoleum of Shakspeare), as restored from the Designs of Hervey Eginton, M.I.B.A. Engraved in outline by Thomas Turnbull, from a Drawing by W. Buttingfield, and inscribed to the Committee of the Royal Shakspeare Club.

THIS is a very fine outline engraving, showing the beautiful roof and alterations that have been recently made in the chancel of the church of Stratford-upon-Avon. In the "Gentleman's Magazine" of last month is a description of the repairs, from which we make the following extracts:—

"The repairs are now brought to a close, the most material defects in the structure having been substantially and tastefully amended by Mr Hamilton, under the superintending care of Hervey Eginton, Esq., Architect, of Worcester, who gave the design for the new roof. That gentleman was recommended to the Royal Shakspeare Club by John Britton, Esq., F.S.A., who has rendered very essential services in the renovation and adornment of this interesting building, as well by his excellent advice, as by the collection of large subscriptions in London and elsewhere.

"On the exterior, the works have been judiciously confined to essentials; that is, the replacing of faulty stones by new ones, and the renewal of the embattled parapet, with the addition of a handsome cross at the point of the eastern gable. The stonework of the two windows of the north wall next he east has also been renewed, their lower portions being filled up with stone (Shakspeare's monument is erected in one of them); but the mullions are made complete and uniform with the other windows.

"In the interior, the repairs consist of a thorough cleansing; a new pavement, in black and white lozenges, so far as the ancient stalls extend; a range of new altar-rails, of a pointed pattern; and, what is the most important work of all, a new oak roof. The ancient roof had been removed, probably during the last century, and a flat ceiling substituted. The new roof is supported by six arched ribs, which rest upon the ancient brackets, each of which is carved with three human heads. The design of the timber work has been carefully selected from buildings of a corresponding age, and their trusses are adorned with figures of angels holding armorial shields.

"The coats of white paint, inflicted by Mr. Malone, are still allowed to remain on [illegible]; but it is on record that the colours of the former were originally, the eyes a light hazle, the hair and beard auburn, the doublet scarlet, the gown black, the upper cushion scarlet, and the lower green, with gilt tassels. Why, then, should the restoration of its original appearance be delayed, particularly as all the colours might doubtless be verified on removing the present incrustation?"

REGULATIONS FOR STUDENTS IN CIVIL ENGINEERING OF THE UNIVERSITY OF DURHAM, PASSED BY THE SENATE AND CONVOCATION, NOVEMBER 22, 1837.

WHEN we consider the immense sums of money required to carry out any Civil Engineering project, the weighty interests involved in it, the ruin to individuals, and the loss to the country entailed by failure, the responsibility attaching to the Engineer is of no common kind.

The Engineer, to enter upon any task of magnitude, ought to bring to it natural talents, expanded by education, and strengthened by experience; he ought to be able to perceive at once, and to apply the maxims of science to the demands of business; he ought to combine the mind of the philosopher with the accomplishments of the mechanic; he ought to be a man of profound judgment; he ought to be able to decide not merely what to do, but what *not* to do; he ought to be accustomed not only to the abstractions of the study, but to the methods and manipulations of the workshop also.

A large proportion, in fact, the whole of the above mentioned qualifications so far as education and a rigid academic examination can effect them, will be induced by the system of regulations and course of study prescribed by the senate; and the practical application of the knowledge obtained at the college will be made most advantageously in the mining districts in the neighbourhood; without this combination of theory with practice, the student, when he enters into the world, will find himself loaded with a quantity of knowledge which he is more apt to forget, than to seek out the opportunity of applying to the advancement of the arts. We have been witness of some miserable failures in Mexico of German students, sent out by the English Mining Companies, in the hope that, inasmuch as they had obtained numerous honorary certificates from Freyberg University, they would be able to effect great improvements in the mode of working the mines, and the method for reducing the ores; we have seen several such men, and they were in every case distanced beyond all comparison by the every day knowledge of a Cornish mining captain; and in one case in particular, a German professor, high in academic honours, with a salary high in proportion, was intrusted to make a most extravagant outlay with the view of introducing the German system of smelting silver by the high furnace; he utterly failed, and was ultimately obliged to send to the "Hacienda of Regla" for the assistance of a German operative to teach him how to effect his own object. Such instances, with numberless others familiar to most practical men, point out the necessity of the students being placed in situations to obtain an insight into the minutiæ of the profession. In the College of Mines in Spain and Mexico, a student, after he has passed a certain period to study, is placed under the superintendence of a mining captain in some of the mines up the country; by this means, if disposed to learn, he has every opportunity to become an accomplished miner. So in the present case, after a student has passed three years in the college, he must consider his education but half complete, and should be articled for at least three years more to some man of business, who would give him the opportunity of perfecting himself in the technicalities of his profession.

The large sum required for a year's expenses, £100, precludes the possibility of any but the richer classes availing themselves of this system, and the Editor of the *Durham Advertiser* has fallen into error in supposing that the field for employment in Civil Engineering is so entirely disoccupied; the fact is the reverse; there is scarcely an opportunity left for a man of genius and learning to obtain employment, excepting through powerful interest; however, those parents who can give their sons such an expensive education, are not likely to be without the means of forwarding their views when their education is complete; the advantages will be great to the public, that men of education will then occupy those stations which, in too many present instances, are held by parties wholly unfit for them.

The regulations of the University meet our entire approbation, and we hope our suggestions may be of service to the parties interested in following them out in practice.

HYDRAULICS.

*Turbine.**—M. Arago lately called the attention of the Academy of Sciences to the *Turbine* erected by M. Fourneyon in the Foret Noire, an account of which had been previously laid before the Academy. M. Arago stated, that this machine is only one foot in diameter, and performs 360 revolutions per minute, under the action of a fall of water 108 metres (354 ft. English) high, with not more than a cubic foot of water acting permanently in the pipe: the useful effect appears to be equivalent to 60 horse power. At the time it was constructed (about a year since), objections were made that the machine would soon be out of order, in consequence of the extreme velocity with which it turns on the pivot. The inventor has, however, discovered the means of supplying oil in the step in such a way as to meet this difficulty. The method is a secret, so that M. Arago could not divulge it.

* A water-wheel on the principle of Barker's mill.—Editor.

ORIGINAL PAPERS AND COMMUNICATIONS.

DESIGNS FOR THE REFORM CLUB.

A general meeting of this club was held at their temporary residence in Pall Mall, on Wednesday, the 13th December, for the purpose of selecting a design for a new building. The architects who had forwarded designs, were Mr. Sidney Smirke, Mr. Blore, Mr. Cockerell, and Mr. Barry. These designs had been open to the inspection of the members of the club some weeks previous to the general meeting. The instructions issued by the Committee of Management appear to have been, to produce a club-house which should surpass all others in size and magnificence; one which should combine all the attractions of other clubs, such as baths of various kinds, billiard rooms, smoking rooms, with the ordinary features, besides the additional novelty of private chambers or dormitories. The site appointed extends from the spot now occupied by the present temporary National Gallery, on the one side of the present club-house, over the vacant plot of ground on the other side. This extent gives a frontage towards Pall Mall of about 135 feet. The Athenæum, in Pall Mall, occupies a space of 76 feet; the frontage of the Travellers is 74 feet; and that of the Conservative, or Carlton Club, 90 feet: the Pall Mall front of the new club will, therefore, be nearly equal to that of the Athenæum and Travellers together, and one-third longer than the Carlton. The introduction of chambers above the ordinary rooms of the club will render the elevation also about a third higher than its neighbours. The ground is rented of the Commissioners of Woods and Forests; and it is computed that the revenue of the chambers, calculated to yield from £1500 to £2000, will cover all expenses of ground-rent, taxes, rates, &c. The mode of letting these chambers, whether to members of the club exclusively, or to others, on long or short leases, has not yet been determined.

Premiums of £500 for the best designs, and smaller sums for the others, were offered; but we have understood they were declined by those gentlemen whose plans were not accepted.

At the general meeting, the choice fell upon the design of Mr. Barry. The preference was nearly unanimous; and, considering the purposes of the building, we are disposed, notwithstanding the several merits which each of the others possesses, to regard the choice as the right one. Independent of other advantages, Mr. Barry's plans entered into much fuller details, and conveyed a much clearer impression of all the various compartments, as well as of the whole of the building, than those of his competitors. He furnished, besides the ordinary plans, sketches of the effect of the more important rooms, in which was indicated the proposed mode of decoration. A similar advantage was possessed by Mr. Barry's plans of the Houses of Parliament. In that instance, too, they were the most numerous and complete. It seems obvious that it is as important to exhibit the perfection of the interior parts, and the architect's own views of all the details of a building, as to present the exterior elevation. And in the case of a club, the elegance, the convenience, and the appropriateness of the interior economy, require accurate specification, because they constitute the primary consideration. Nothing should be left to the imagination; and as a general principle, it may be laid down that no architect misbestows his labour in entering into all the minutiæ which elucidate his design. No complaint of want of explicitness can be made against Mr. Cockerell's designs, but it cannot be doubted that Mr. Blore's designs attracted less notice than their intrinsic merits entitled them to, solely on account of the scantiness and inexplicitness of their details. Not even the mensuration of his rooms was expressed. Surely mere outline of figure is insufficient to convey an accurate idea of length, breadth, and height. Next to the plans of Mr. Barry, those of Mr. Cockerell appeared to receive the approbation of the members.

We shall now proceed to give a brief notice of the features of each, beginning with the design of Mr. Barry, the successful candidate.

In the exterior, Mr. Barry has aimed to produce an elevation, in harmony with his own elegant Travellers' Club, and its neighbour the Athenæum; and, though producing a structure nearly twice as large as either, he has succeeded in not detracting from their importance, and in preserving the superior grandeur of the Reform Club. We fear he found it necessary to leave the Conservative to its chances.

Mr. Barry has evidently kept before him as a model, the celebrated Palazio di Farnese at Rome, designed by that mighty universal genius Michael Angelo Buonarotti, during the Pontificate of Paul the Third, A.D. 1545, and built by Antonio Sangallo. It will be remembered that the Farnese Palace contains the gallery of Annibale Carracci. Even with the necessary modifications, Mr. Barry's elevation fronting Pall Mall bears a very strong resemblance to the Farnese Palace, and the adoption of so splendid a model affords evidence of Mr. Barry's excellent judgment and correct appropriation of a design most suitable to the purpose. The new club, though consisting of six floors from the basement, will present in Pall Mall a frontage of only three from the ground. The basement and mezzanine below ground and the chambers in the roof being unseen. The entrance, like the Travellers, is several steps above the ground, and in the centre of the building in Pall Mall. There are four windows on each side of the entrance; nine windows equi-distant on the first floor, and the same number on the second. The pediments surmounting the windows on the first floor in Pall Mall are supported by Ionic pilasters; and at the back, overlooking Carlton Gardens, by Ionic pilasters, rusticated. The height of the ground and first floor is on the same level with those of the Travellers. A ballustrade, somewhat resembling that of the Travellers, rises from the ground. The whole design is one of massive grandeur. Our admiration increases with the examination of the arrangement of the interior details. An Italian court ($34\frac{1}{2}$ ft. by 29 ft.), beginning at the base, is placed in the centre of the quadrangle. And the apartments on the ground, first, and second floors are approached through corridors, lighted from the court, which on the ground and first floors are 9 feet wide. On the second floor the corridors leading to the lodgings are contracted to $5\frac{1}{2}$ feet. The area of the basement in Pall Mall is 9 feet wide, and in the gardens 8 feet. On the basement, every sort of culinary office seems provided, and located with singular judgment and convenience. The kitchen is 29 feet by 22 feet, and is fitted up with all the apparatus necessary for each peculiar system of cooking. The kitchen court is 23 feet by $14\frac{1}{2}$ feet; the steward's room 26 feet by $18\frac{1}{2}$ feet; butler's pantry $16\frac{1}{2}$ feet by 14 feet; the scullery 20 feet by 14 feet; the cook's room 17 feet by 12 feet; besides a host of smaller rooms, larders for pastry, poultry, and game, raw and cooked meat; hardware room, housekeeper's store-room; cellars for wine, ale, beer, and bottling. The number of apartments on the basement exceeds thirty. In the mezzanine or entresol, we find the butler's, housekeeper's, and still rooms; nine dressing and bath rooms of several kinds, vapour, shower, &c., and 16 male servants' rooms, besides the upper parts of the kitchen and larders, which enter this floor. On the ground floor, we have already noticed that the approach to the several rooms is through a quadrangle of corridors. The coffee room is the principal chamber, having a view into the gardens. Its length is 117 ft. by 28 ft., and is supported by Ionic pillars. There is a writing room, 40 ft. by 27 ft., adjoining to another room, to be appropiated to newspapers and periodicals, $28\frac{1}{2}$ ft. by 27 ft. The house dining-room, intended for private parties of the members of the club, is 29 ft. by 18 ft.: moreover, there is a steward's room, $16\frac{1}{2}$ ft. by 14 ft.; a waiting-room, 19 ft. by 14 ft.; two audience rooms, $12\frac{1}{2}$ ft. by $8\frac{1}{2}$ ft.; and a porter's room, $10\frac{1}{2}$ ft. by $9\frac{1}{2}$ ft. In all, nine apartments on the ground floor.

First floor.—The drawing-room is above the coffee-room, and of similar dimensions, 117 ft. by 28 ft. It is supported by Corinthian pillars, and so constructed that, if required, it may be divided into two or three rooms. There are two libraries, both supported by Corinthian pillars. The dimensions of the one are 40 ft. by 27 ft.; of the other, $28\frac{1}{2}$ ft. by 27 ft. There are two billiard-rooms on this floor; one 22 ft. by 18 ft.; the second 23 ft. by $17\frac{1}{2}$ ft. The committee-room is $33\frac{1}{2}$ ft. by $17\frac{1}{2}$ ft. An accountant's room, 13 ft. by $7\frac{1}{2}$ ft.; and a small reading-room, 12 ft. by 10 ft.; members' private room, 17 ft. by 13 ft.; and waiting-room, 20 ft. by 14 ft.

The second floor is disposed of in twenty-six chambers or lodgings, the dimensions of each varying from 22 ft. by 14 ft. to 12 ft. by 10 ft.

There are about thirty-one rooms in the attic floor, which are intended for the female servants of the club, and the servants of the renters of the chambers. We have here upwards of 134 several apartments in this building; the judicious disposal of which can only be duly estimated by reference to the plans themselves, and these we hope to place before our readers hereafter.

The cost of realizing Mr. Barry's design is estimated at £45,000, and at present it is proposed to commence active operations in June next.

We are compelled to be somewhat brief in our account of the designs of Mr. Cockerell and Mr. Blore; of those of Mr. Cockerell, because we have only enjoyed a temporary glance at them; of Mr. Blore's, because the mensurations are not specified. The most striking feature of Mr. Cockerell's designs, was the magnificence of the hall and staircase. None of the others could compete at all in this respect with Mr. Cockerell's. The front, towards Pall Mall, presented three floors above the ground, and a series of nine windows in each. Between those on the first and second floors, were placed massive Doric columns. Mr. Cockerell appeared to employ the whole of the utmost length for his frontage; and certainly his designs conveyed the impression of a much larger and heavier building than the others. The number of the floors was the same—consisting of a basement, a mezzanine, ground, first, and second floors; and the number of the rooms, we think, exceeded that of Mr. Barry's design. After Mr. Barry, Mr. Cockerell's designs were most worthy of choice, though, as a matter of taste and fitness, we prefer the exterior elevation of Mr. Blore to that

of Mr. Cockerell. Mr. Blore adopted the modern Italian style. His Pall Mall front is of much simplicity and elegance, the entrance being in the centre, with three windows on each side. The garden front is more ornamented. In this, Ionic pilasters support a balcony on the second floor. A balustrade rises from the ground.

The basement floor comprises about twenty-two rooms, viz., the kitchen, scullery, cook's, coffee and still, housekeeper's, servants', butler's, larders, and cellars. The lower mezzanine is appropriated to servants' bed-rooms, baths, and dressing-rooms. On the ground floor are the coffee, morning, serving, billiard, and private dining-rooms. On the first floor, the library, drawing, committee, serving, billiard, and secretary's rooms. The upper mezzanine is occupied with seven bedrooms, and the upper part of the library and drawing-room.

The second floor is disposed of in lodgings.

The exterior elevation of Mr. Sidney Smirke's design is very different from all the others, partaking of the character of a highly ornamented Corinthian temple, and, though magnificent and imposing, appears not altogether most appropriate for a club-house. The entrance and principal front is at the western side of the ground, opposite the Conservative Club. This consists of a grand portico of four Corinthian columns. This spot is too close to the Conservative Club to exhibit a large portico to advantage. Indeed the portico, which is the most striking feature in Mr. Smirke's design, is so placed, that its effect is wholly destroyed by its proximity to the opposite building.

His Pall Mall front, like the other designs, has three floors, and presents a series of seven windows on each. The building is surmounted by a balustrade. It appears to us that the exterior is little in harmony with the surrounding buildings, and that it is not applicable to a club-house, which seems to require internal convenience rather than profuse external decoration. But it is upon the exterior that Mr. Smirke has bestowed all his attention in this design, and for the sake of his portico he has sacrificed a considerable portion of space. His Pall Mall frontage occupies only about 110 feet, whilst there were nearly 140 feet available. Under the circumstances, we do not think 30 feet, or thereabout, should be given up to a portico which nobody could see. We fully admit the beauty of the design, while we dispute its appropriateness.

The basement comprises the kitchen (33½ ft. by 33½ ft. and 24ft), scullery (22 ft. by 18 ft.), cook's room, servants' hall (25 ft. by 21 ft.), men's cleaning room, larders for dressed and raw provisions, fish, vegetables, beer, wine. On the mezzanine there are thirty rooms, consisting of a billiard-room (28¾ ft. by 23 ft.), bath and dressing-rooms, men's sleeping-rooms, rooms for butler, steward, housekeeper, &c. On the ground floor, the entrance hall occupies 33¾ ft. by 23 ft., and the principal staircase 64 ft. by 33¾ ft.; the secretary's room, 20 ft. by 15 ft.; waiter's room, 22½ ft. by 18½ ft.; house dining-room, 32 ft. by 29 ft.; a morning-room, 62 ft. by 32 ft.; and the coffee-room, which looks into Pall Mall, 110 ft. by 32 ft.

Above the coffee-room, on the first floor, is an evening-room, 110 ft. by 32 ft. and 68 ft. There are two libraries, which open into each other, the dimensions of each being 50 ft. by 32¼ ft.; and a committee-room, 23 ft. by 19 ft. on the same floor. On the second floor there are twenty-two rooms, many united, which are intended for chambers; they are approached by a corridor, around an open area, over the roof of the principal staircase. Besides, there is a smoking-room.

RALPH REDIVIVUS. No. 1.

SOMEWHAT more than a century has now elapsed since the first appearance of Ralph's "Critical Observations on the Public Buildings of London,"* which has since continued to be a sort of stock book and authority for architectural opinions. In its day, it may be allowed to have deserved the repute it acquired, were it only as an attempt to popularize criticism on the subject it treated of; but even those who still appeal to it must allow, that it is now somewhat *passé*. During the last hundred years we have both learnt and unlearnt much in regard to architecture. We have become acquainted with Grecian architecture, and discovered it to be something very different from what had been previously imagined by those who received the Roman and modern Italian versions of its orders as indubitably exact copies of their Hellenic and Asiatic prototypes. Even a penny a-liner would now be ashamed of calling Jones's building at Whitehall Grecian, or applying the same epithet to St. Paul's. We have learnt that the orders, as practised by the Greeks themselves, were of a widely different character from those traditionary copies of them which had been so long received as legitimate, and to which the utmost perfection was ascribed, as being the genuine productions of a people who had carried the arts to the highest pitch of excellence. Besides that the taste they exhibited in regard to detail, form, and composition, was utterly dissimilar from that manifested in the productions of the so-called classical Italian school; it has recently been discovered that it was still more at variance with doctrines hitherto generally established, inasmuch as colour—*lithochromy*, or *polychromy*, was resorted to by the Greeks, for purposes of exterior embellishment, even of columns; and that a fanciful luxuriance in this respect prevailed in buildings which were otherwise in a severe style of art. On the other hand, again, the Gothic style, which used to be reprobated in Ralph's time, as unworthy the name of *regular* architecture, as the offspring of ignorance and bad taste, as devoid of all harmonies and proportion, as fitted only for monkish, gloomy, and barbarous edifices, has not only been amply vindicated and taken into favour, but has been advocated by some in terms of exaggerated, if not of exclusive admiration. While they contend that it is our national style *par excellence*, they assert that the beauties of its Grecian rival sink into insignificance and insipidity in comparison with it.

All this must necessarily have had some influence upon opinion and criticism, in consequence of which different views are now entertained of the art from what were held a century ago. Even had nothing of the kind alluded to happened, still even the mere increase of buildings since the time of Ralph, particularly in our day, and of late years, would somewhat alter the estimation which many obtained two or three generations earlier. All merit is comparative; nor is there any exception in this respect, as affects productions of architecture, any more than those of literature. A few standard works survive, the rest are neglected; and whether such ought to be the case or not, such or nearly such is it in regard to architecture.

Time was, when anything bearing a decent resemblance to an ancient portico was cried up as a phenomenon, a portent, or prodigy. Good-natured critics were in absolute ecstacies;—they talked not of the "age of Periwinkles," for they had hardly then reached that *pons asinorum* of erudition, but they did what answered their purposes as well—descanted on Vitruvian proportions, on harmonies of the most volatile and ethereal quality, yet easy enough to be caught and brought into subjection by a foot-rule; lastly, they promised that *ne plus ultra* of immortality to the lucky wight to whose conception the world was indebted for such a masterpiece, predicting that his reputation would last

"As long as Atalantis shall be read!"

But, alas! for the treachery of fame! the reader here stops to inquire who, or what was Atalantis; for which information he is desired to step either to the Moon or the Museum.

"Since all things lost on earth are treasured there,"

—in one of those two capacious repositories.

Lest the reader should imagine, from this very curveting strain, that we have fairly sent thither both our wits and our subject, or that we occasionally get astraddle on a hippogriff, let us descend a little from our flight, and curb in that restive Pegasus, our pen; especially as we shall else be reminded, that we are nothing akin to our worthy predecessor Ralph, whose staid—and not to speak it profanely, rather prosy mode of criticism, is in altogether a different strain—one which may be said *sentir de la perruque*. Therefore, instead of losing time in hunting after the thread of our argument, we will not exactly commence *de capo*, but start afresh by asking, who now talks of the "magnificence of the Adelphi," or Portland Place? Who, save some antiquarian Dr. Dryasdust, can find any interest in the heavy uncouth city churches? which, with here and there an exception, partake as much of classical taste, as a Dutch burgomaster does of the Antinous. Who, again, regrets that old St. Paul's School has been swept away; or that the Warwick-lane College of Physicians has been converted into a butchery, and the carcases of prize sheep and oxen hung up beneath what was its anatomical theatre? Old St. Dunstan's, with its clock, one of the sights and wonders of cockney-land, has been swept away; and even that venerable piece of most orthodox ugliness, Exeter Change, has similarly fallen a victim to innovation and improvement. Serjeant's Inn, that curious and highly instructive specimen of what our metropolitan street architecture used, at one period, to be, has still more recently disappeared; owing to which the physiognomy of that part of Chancery-lane has assumed a totally different character, so much so, that the opposite neighbours doubtless wonder to what new region of the town they have been transported.

In fact, mutation is busy everywhere: Algiers has had a narrow escape from being Parisianized; Egypt is getting every day more European, not to say Londonized; the land of the Pharoahs will, ere long, be traversed by railroads and steam-vessels; and could our old friend Ralph revisit earth, he, too, would doubtless feel a change come over him, and somewhat modify, if not entirely alter, some of his opinions, including that wherein he is so liberal of admiration towards the east end of St. Martin's Church, which he pronounces to be "remarkably elegant, and justly challenges particular applause." As, however, we cannot recall that worthy from the tomb in *propria personae* we adopt as the very next best course, that of masking ourselves in his habiliments, trusting that in so doing we shall exhibit quite as much ability, not very much less quantum of *nous*, and, perhaps, a grain or two more taste. We have certainly a far ampler field before us than he had. Not only are there numerous fresh subjects of the same sort he had before him, but various classes of others which did not then exist. We have now an entirely new genus of palazzo-like edifices—the club-houses; another under the denomination of arcades, although here we are afraid we must as yet restrict ourselves to the singular number, there being only the Lowther, unless we add to it that on the west side of the Opera House, that makes any pretension to architectural effect. Besides these, and other novelties, there are one or two others altogether *sui generis*: for instance, the Pantheon Bazaar, and the Colosseum.

The building we shall first speak of—but it is now too late to think of

* It is exceedingly doubtful whether Ralph was really the author of the "Critical Remarks," or merely adopted the offspring of another man's brain. Incredible as it may appear to those who, uninitiated into the mysteries of literature, regard a title-page as an affidavit, the latter case has happened frequently ere now, both before and since Ralph's time. What tends in some degree to confirm suspicion in regard to him is that although he was rather a prolific writer, the "Remarks" are the only piece of the kind professing to come from his pen.

making a formal beginning at the conclusion of a preliminary, whose length has left us little space, and whose tone is not exactly accordant with that of sober criticism, nor such as we mean to indulge in in our future papers. Bating the other differences, and that it is less egotistical, and not so ambitiously pathetic, our present scribbling is somewhat à la Preliminary Essay by the learned antiquary of the firm of Faraday and Co. Every thing must have a beginning; and should ours be after a fashion the reader likes not, we hope to satisfy him better when we next meet.

REMARKS ON COMPETITION ESTIMATES BY AN ARCHITECT.

Sir,—In your last number a correspondent expressed himself upon the subject of competition estimates, and reflected properly upon the mode occasionally adopted both in obtaining estimates and fulfilling contracts. The writer is probably an architect; let me offer him a few suggestions, and while in full reciprocity I acknowledge evil does exist among building branches, request him to unite in condolence with one who laments that the profession also has its full share; this done, relieved by confession, we may set to work and clear the grey hairs from our neighbour's wigs, without fearing the return of the same kind offices on our own. First, then, when a city district was lately to be surveyed, competition estimates were given, a highly talented architect offered his services for 200*l*.; an equally experienced brother estimated the value of his services at very nearly the same cost; when, lo! a much *greater man* than either undertook the same matter for 40*l*.!!! The parish of Lambeth was to be surveyed, two well-respected gentlemen estimated the labour at 6,000*l*.; in utter defiance, others offered to execute the Herculean task for 1,200*l*., and the gradations between, ascended in *sol. fa. accordana* from a host of expectancies: 2,400*l*. were the closing terms. Workhouses! but they are a tender subject, have not they been done wholesale at half the usual remuneration? and in consequence, did not the Reform Club House Committee offer to three distinguished architects terms which would have unstrung the nerves of a Jew orange boy? and did they not barter and cheapen, until they found that talent and honourable pride and gentlemanly feeling would no longer submit to so derogating an outrage upon the customary tribute to its worth? To all this, without bringing forth devoted instances of architects acting gratuitously to public bodies for sinister motives, as now the case, or of mentioning little circumstances of forty architects voting each his own work better than his successful rivals, to all this let us plead guilty, and prepare for building crimes.

There is not an architect, there cannot be a surveyor who has not been most artfully dodged by some one of the genus of undertakers, contractors, or otherwise, as they may be defined, who has not been obliged to risk his neck, spoil his nether garments, and burn his boots through with lime, in the double duty of increasing the quantities of good material and decreasing the superfluity of the worthless; who has not multiplied writings, written notices, arrested progress, and stopped payments, his own, of course, in the act; and all because the figure in the thousands had been wrongly cast in the builder's estimate, or that the builder had laid a good-humoured plot of doing the work entirely at the expense of his timber merchant, and by way of practical joke upon the architect, compelling him to work doubly for one half the otherwise amount of his commission. It is not to be wondered that such annoyances should prompt the wish to root up the system of competition altogether, to bring back the times when work, if done well, was well valued; or, if ill done, proportionately paid for. But let us not vainly endeavour to arrest the march of emulation; rather let us see where the objections lie, and trace them to its origin; in fact, let us, in the same spirit of candour with which we set out, confess ourselves the springing stones of offence. Few will deny the advantages of well-conducted competition; it is an honourable stimulant to mental energy, to the powers of arrangement, invention, and calculation; it tends to simplify, perfect, and economize constructive art; it maintains the equality and moderation of the several sources of supply; and it produces for ordinary use, at reasonable prices, that which monopoly would prohibit, but to the rich. The broad assertion, that works done by contract are worse executed than others for which a different principle has been adopted, is not true; the execution of our public works does honour to the names of our large contractors. Contract work is only ill done when the architect, or the employer, thrusts into the competing list, one of little talent, small means, and no principle. Talent in a contractor is as necessary for the executive as genius and science for the design. A large plant and unlimited credit is indispensable for excellence and dispatch. The want of principle is an evil increased by the addition of the two former qualities. A contractor who undertakes a building 40 per cent. below a remunerating price (no uncommon occurrence) can have but one of three motives, either to evade or supersede the contract, or cheat his merchant by compounding or insolvency. Let, then, the profession carefully sift the means, pretensions, and characters of contracting builders; let them apportion to them, according to their respective means, the different classes of engagement; let them, above all, found their own calculations upon those chances of depression only which may follow from superior management and greater facilities of trade, and not moderate their estimates upon the probability of those ruinous contingencies which fraud or miscalculation so frequently produce; let them do this, and they will no longer be stigmatized as the supervisors of insecure works, nor lament that the system of contracting, as it now operates, doubles their labours, while it halves their incomes.

Yours, &c., AN ARCHITECT.

GRAND JUNCTION CANAL RESERVOIRS.

Upon this extensive line of canal there are eight reservoirs, and all of them are between the summit level and its northern extremity, at Braunston, where it joins the Oxford Canal. The summit level, which is 3¼ miles in length, is situated within one mile and a half of Tring, in Hertfordshire: this level is 57 feet above the junction at Bramston, and 395 feet above the River Thames. The lowest intermediate level is that at the aqueduct, near Stoney Stratford, in Northamptonshire, which is 192 feet below the summit at Tring. A second summit is situated near Daventry, which is 37 feet above the junction at Bramston. To maintain a supply of water to these summits, the eight reservoirs are appropriated; six to supply the Tring summit, and two to supply the Daventry summit. Their contents and extreme depths are as follows:—

Reservoirs.	Contents in Locks of Water.	Extreme Depth. Feet.
Daventry	7205	35
Drayton	1337	26
Marsworth	994	18
Stanhope's End	2296	24
Tring	1016	20
Wilston (Old)	1413	15
Wilston (New)	1413	18
Weston	1856	22

Each lock is computed to contain 9000 cubic feet of water.

It so happens, that not one of these reservoirs are on the same level with that of the summit at Tring, but are at various levels; the highest and nearest one, which is Marsworth, being 31 feet (nearly) below it. Consequently steam power is necessary to raise the water from one reservoir to another, and to the summit level, which receives but a very small supply from springs in the immediate vicinity, and which small supply has been recently diminished by the deep cutting on the London and Birmingham Railway, which is near at hand, and being much lower than the level of the canal, has cut off some of their supply.

The *principal steam engine*, and that which *pumps the water into the summit*, is the one nearest thereto, called in the neighbourhood, the Tring engine: some of its dimensions, &c. are as follow:—

	Ft.	Inch.
Length of beam, from centre to centre	24	8
Interval between the centres of the lifts	9	8¼
Length of stroke	7	9
Diameter of cylinder	4	0
Lift of water, when the reservoir is full	27	2

A 32-inch bucket is used until the water is lowered 19 feet, when a 28-inch bucket is substituted.

The consumption of coals is said to be 1½ cwt. per hour at a 40 feet lift. The engine is also said to work at twenty-four pounds pressure, and make ten strokes per minute, and to pump up about eighty locks, of 9000 cubic feet each, in twenty-four hours. The power is estimated at about 70-horse.

This engine has recently (we believe within a year) been clothed after the manner of the Cornish engines, about the duty of which so much has been said. Before the alteration, the radiation of heat from the boiler was so great, as to render it extremely unpleasant to enter that part of the building; but after it had been clothed, a person could walk on its top without feeling the surrounding temperature higher than would be necessary for an ordinary apartment. The manner in which this is accomplished is by covering the boiler with sawdust, which is a non-conducting substance, and this covered with bricks laid dry; the cylinder is cased with wood, and the interval between the cylinder and case in like manner filled with sawdust.

Between Blisworth and Stoke Bruern, in Northamptonshire, there is a tunnel, on the line of canal, 1¾ mile long, through the same range of high ground that the deep cutting on the Birmingham and London Railway is made, where that eminently scientific engineer, Mr. Stephenson, has executed a most interesting work in the undersetting of a rock.

REMARKS ON "OBSERVATIONS ON THE NEW HOUSES OF PARLIAMENT."

Sir,—In perusing the last Number of your valuable Journal, I find one article which, I think, deserves and desires refutation from an abler pen than mine; I hope, however, that the few remarks which I am about to make will be sufficient to show the absurdity of the propositions made by your correspondent in his "Observations on the New Houses of Parliament."

He commences by giving his qualifications to judge, and his reliance on that judgment, which it appears has been formed by "extensive travels through England, France, Italy, and Germany," by the performance of which tour, he considers himself equally qualified to judge with those who have made architecture the study of their *lives*, and not merely devoted "hours" to its attainment.

I will now examine his first interrogation.—"With what view," he asks, "has the proposed site been chosen by the architect?" If your correspondent had referred to the original notice to architects who were desirous of competing for the building, he would have seen that the site was pointed out, and that they were limited to a certain space; and this was issued by the Commissioners.

If, therefore, any blame is attachable for the selection of the proposed site, the architect cannot in any wise be deemed responsible, and it was not, therefore, in Mr. Barry's power to act in accordance with the suggestion of Vitruvius, which your correspondent, in his infinite wisdom, deigned to point out. Again, in his appellation of St. James's Palace, "a vile heterogeneous fabric," he is altogether mistaken, and I doubt much whether, in his vast travels, he ever reached the interior, or he would not have been so determined in his judgment; neither can he be aware, that it is impossible that a court can be holden in the Buckingham Palace, which the demolition of St. James's

would render necessary. With regard to the exterior of the latter, few can admire it; but the very fact of its containing eight of the largest rooms in Europe, would secure it from destruction; at least, in the mind of any reasonable and unprejudiced person.

Your correspondent then favours us with a *very* vague idea of the plan which he considers the best to adopt. Surely this is unkind—why did he not remember his duty to his countrymen before, and at the due season have furnished a plan which he considers so truly beneficial?

But his great mind condescends to lower itself, and apply its task to articles of furniture. He considers that the throne should merely be a *simple "chair of British oak*, with a velvet crimson cushion."

We should imagine from his style, that "during his extensive travels" he had devoted a few hours to the art of Upholstery.

I had hoped, in perusing the commencement of his article, that his taste had been so far formed by travelling, as to delight in the beauties of antiquity; but I was miserably disappointed when I *reached* the paragraph in which he had the hardihood to assert, that "Henry the Seventh's Chapel has now the same *begrimmed* complexion as its parental Abbey."

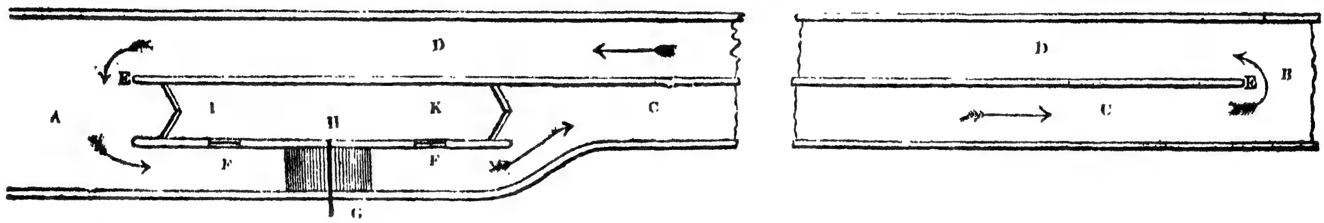
I appeal to you, sir, whether it is possible to look to that man for sound judgment, or refined taste, who designates the Cathedral Church of Westminster "an old MURKY Abbey, from which the sweepers might collect at least one hundred bags of soot!!!"

He seems to consider, that in the brightness and cleanliness of the exterior face of a building, consists a beauty which cannot by any means be surpassed, and that the selection of the site and stone, which will render those beauties most lasting, should be the principal object for the solicitude of the architect. I very much question whether Mr. Britton's opinion on such matters at all agrees with that of your correspondent. He is not aware that the means which he proposes to pursue in order to prevent the execution of Mr. Barry's design have already been agitated, and were unsuccessful. He concludes by saying, that he knows not the man—neither do I—but this I do know, that all structures which have been executed under his superintendence, will bear the strictest scrutiny, aye, even of a *Continental Tourist*.

I will not trouble you further than by observing, that it is a pity but that amateurs should be more circumspect in the opinions which they assert; seeing first that those opinions are well grounded by the study of that art which they attempt to deteriorate. I argue, sir, that it is impossible for a casual observer of the architectural beauties of this or *any other country* to acquire that knowledge which alone can be attained by industrious and indefatigable study.

C. W. I.

IMPROVEMENTS ON CANALS AND THE MOTIVE POWER THEREON.



At page 27 of our Journal the reader will find, among the patents there mentioned as having been granted between the 28th of September and 26th of October last, the following record:—"Henry Robinson Palmer, of Great George Street, Westminster, Civil Engineer, for 'Improvements in giving Motion to Barges and other Vessels on Canals;' 20th October." We are now enabled to lay before our readers some particulars of the method adopted by Mr. Palmer, and which forms the subject of his patent: these particulars we believe to be the first laid before the public.

Mr. Palmer, who, it is well known, has had extensive experience in canal and hydraulic works, has for a length of time devoted his particular attention to that complicated, and at present very imperfectly understood, *theory of rivers*, and has made a very extensive and important collection of experiments in various rivers and canals; and, from the discussion of these experiments, we sanguinely look forward to some additional light being thrown upon that difficult and important subject. It was, as we understand, during these investigations that Mr. Palmer contrived the canal improvements which form the subject of his patent, and of which we shall now attempt to give some idea; but it must be understood, that the engraving at the head of this article is not drawn to any proportion, but is a *sketch only*, to give a knowledge of the plan; even the details of the arrangements may possibly undergo considerable alterations by Mr. Palmer, in carrying his plan out on a large scale.

Each pond of the canal, as AB, is divided into two parts or channels C, by a wall EE; a third and short (or side) channel FF is also formed by another wall, in which two sluices I and K are inserted; these sluices connect the short channel F with a lock formed by two pair of gates in the channel C; at G, in the side channel, a *fen*-wheel, similar to an undershot water-wheel, or the paddle-wheel of a steam-vessel, is fixed, to which motion is communicated by steam or other fixed power; the revolution of this wheel communicates motion to the water in the direction from F to C, and (as it will readily be perceived) in the direction of the arrows, through the whole length of the channel C, round the extremity E of the pond, along the channel D to the further extremity, and again beneath the wheel G, and then by C, as before. By this simple, but admirable contrivance, the traffic can be conveyed in both directions, and to any extent whatever, by the same power, which, if steam be the power used, can also at the same time be employed in working the machinery of corn or saw-mills, &c., according to the demands of the neighbouring locality, and very advantageously, as the canal affords a ready means of conveying the raw material to the mill, and the subsequent produce to the distant market.

The introduction of the lock H in the channel C, appears to be the maintaining of the current in the direction of the arrows, as above stated, or the wheel would not produce the desired effect, it being necessary for the wheel to be kept out of the main channel C, that the motion of the traffic may be uninterrupted; the lock is to be so constructed, that a passing barge shall push the gates open before it for its passage: thus, suppose a barge was passing from A towards B, it approaches the lock H with whatever impetus it may then have, the sluice I is opened by a lock-keeper, who may also have charge of the steam-engine; upon this sluice, or valve, being lifted, the water will pass from the lock, by the motion of the wheel, into the channel F and C, leaving the surface of the lock at a lower level than that of the channel D; and as the gates open inwards, the water, together with the impetus of the barge, will open them, and the barge will enter the lock, and the gates will again close; this done, the valve K is to be opened, which producing a current in the direction C, enables the barge to push open the second pair of gates, and so pass on in the direction of its route: the passage of these locks will delay the barges so little as not to be worth noticing.

A LETTER FROM MR. G. GODWIN, JUN., A.I.B.A., ON HITCH'S "PATENT REBATED BRICKWORK."

SIR,—The geological position of London has rendered bricks the principal material used for building in the metropolis, and one might reasonably expect that any reputed improvement in their construction—any invention tending to lessen the cost of brick edifices, and at the same time increase their durability, would be immediately investigated by those interested in the matter, and universally adopted if found effective. Men, however, individually are averse to change; they view any new invention, any fresh road, as they receive any new truth, with great caution, if not mistrust, and prefer following a path which they have before trodden to venturing on one recently opened, although assured that it would save them half the distance; generally neglecting to profit by the information, until it has been again and again reiterated and re-urged. Under some circumstances, perhaps, it is fortunate that this is the case, for excellence is of slow growth, and constant change would sadly militate against perfection. Still the result, to individuals and to science, is oftentimes disastrous. An ingenious man having, by the sacrifice of property, and the exercise of his faculties, perfected an invention of real value, obtains a patent, and seeks the reward due to his skill and ingenuity; before, however, the mistrust of which we have spoken is overcome before the public will venture to inquire for themselves, or be persuaded to avail themselves of the advantages which he demonstrates, the term of his patent, in many cases, expires, and others less deserving, but more politic, receive the advantages in a pecuniary point of view which should have been his. The inventor of the new method of building, respecting which I am about to speak, will not, I trust, prove a case exactly in point, his system being now (as indeed it has been for some years past) pretty extensively used in the county of Herts—the locality of the patentee—in Essex, Hampshire, and elsewhere. Still its reputed advantages are not known in the metropolis, and I now beg, solely with a view to inquiry, and from a desire that "the race *should be* to the strong," to communicate, through your pages, such knowledge of the matter as I have gained by experience. I cannot enter upon the subject so fully as I would do willingly

were my time less occupied than it is; but hope that what is said may induce an investigation of the system on the part of others better qualified to guide the public than myself.

The invention comprises, first, a peculiar formation of the bricks, which are of large size, and present a bold and uniform face; and, secondly, the introduction of concrete, formed of lime and ballast, in the construction of the wall. The bricks, moulded in various forms to suit the several offices of headers, stretchers, bat-headers, &c., are all so made as to dovetail into each other, and to present in the interior of the wall a series of cavities communicating with each other by means of dowel-holes through all the bricks. Into these cavities, as the work proceeds, concrete is introduced, and thus the whole wall is rendered a solid mass. The cost of the work varies from 20 per cent. to 50 *per cent. less than the cost of ordinary brickwork*, according to the thickness of the walls; which saving, it would seem, is effected through the difference in price between concrete and brickwork, the smallness of the quantity of mortar required, and the diminution of labour occasioned by the size of the bricks. Where an extraordinary degree of strength is necessary, iron rods can be introduced through the dowel holes, and the greater the thickness be that is required, the greater is the saving, compared with common brick, which would be attained.

The patent was obtained in the year 1828; but my own experience will not carry me farther back than 1832. About that time I used the rebated brickwork in stabling and office-buildings (as I have done in many instances since, as well as for more important purposes); and the whole of the works stand remarkably well. I had occasion last week to cut into one of the walls so constructed, and I may safely say, that it had become a complete rock, and for a long time resisted all the efforts of the workmen.

The appearance of the work when completed is good, and if it be coloured, it has, from the large size of the bricks (12 to 15 inches long, and 5 inches high), the aspect of ashlar.

Garden walling is executed with dowelled bricks at little more than the cost of common wood fencing; and walls so built possess several advantages over ordinary brickwork, especially in regard to horticultural purposes. For example, the mortar joint being very small, is less liable to afford harbour for insects, and when injured by frost, &c., may be repaired at little expense. There are in the Royal Gardens at Hampton Court several walls thus constructed.

The same clever individual, Mr. Hitch, has also made a variety of wedge-shaped arch bricks, with a view to avoid the large mortar joint which necessarily occurs in arches constructed of common bricks; and several bridges have been built with these in various parts of the country. I have used them in many instances for vaults with advantage.

In concluding this hasty notice, permit me to observe, that the subject of brickwork in general, as at present executed amongst us, offers many points for consideration and inquiry, and well deserves a greater share of attention from the architectural student than it usually receives. With your permission, I shall offer, on some future occasion, a few remarks touching constructions in brick, and the ordinary methods of bricklaying; and in the meantime subscribe myself,

Yours, &c.,

Brompton, *Dec. 9th*, 1837. GEORGE GODWIN, JUN.

CURTIS'S RAILWAY CHAIRS.

The form of the rail R, and chair C, as shown in Fig. 1, is the same as those now in use; but the space for the key is made rounding in the middle, as shown in Fig. 3.

Fig. 1.

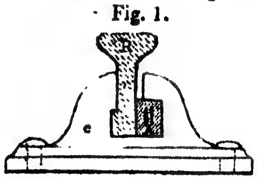
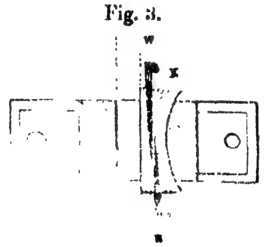


Fig. 3.



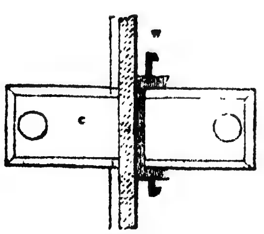


Fig. 2.

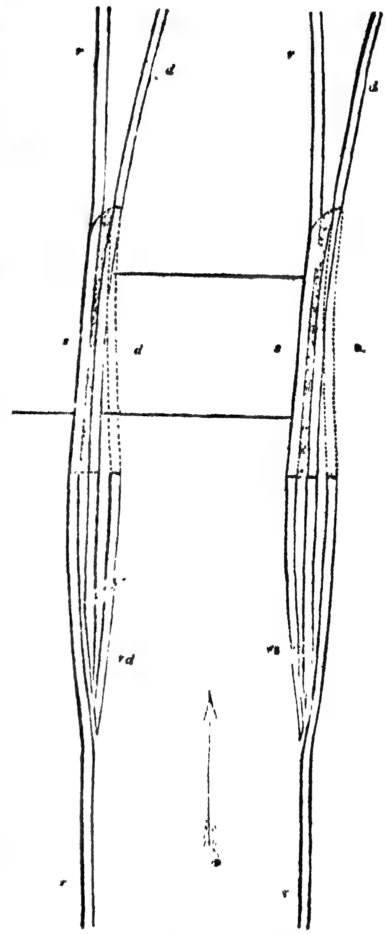
Fig. 4.

When the rail is in its place, a piece of straight grained oak, K, is driven into the key-way, and then folding wedges, W, with claw heads, are driven both sides into the oaken key; thus, the wood becomes violently compressed, and adapts itself to all the conditions of the rail and chair; and for the joint chairs, it will make no difference what may be the variations or twist in the two rails, as the wooden key will, in every case, adapt itself to circumstances, the wedges are drawn back by a set hammer, when it is necessary to take up a rail; this method will hold the rail much more steadily than either an iron or wooden key solely; the shake or jar produced by the train passing over the rails, will not affect the wedges, and they will always remain tight, particularly if care be taken to drive in the wooden keys, when they are dry, the elasticity also of the timber admits of driving the wedges tight, without breaking the chairs; it is thus clear, that the rails of every railway, of whatever figure they may be, can be secured in this manner without any difficulty; in fact, this method is not only better but much cheaper than that usually adopted.

Fig. 1 is an end view; Fig. 2 a plan; Fig. 3 a plan showing the form of the key-way and key when the wedges are driven; Fig. 4, side view.

CURTIS'S RAILWAY SWITCHES.

The annexed figure show the Switches so arranged, that an engine can never run off the line, under any conditions of the switch being placed wrong; this object is effected by forming the switches double on both sides, and laying down supplementary rails *r d*, *r s*, which correspond respectively with the diagonal and straight bars of the switch. Referring to the engraving, if an engine be coming along the line *r*, in the direction of the arrow, it will pass over the diagonal switch and cross the line; if coming along the line in the reverse way, it will pass over the straight bar of the switch and enter the line by means of the supplementary bars, *r s*; if the switch be made to occupy the space shown by the dotted line, and an engine is coming along the line in the direction of the arrow, it will pass straight along the line, and if coming the reverse way along the diagonal line, it will pass along the diagonal switch *d*, and enter the line by the supplementary bars *r d*.



The improved Switches represented in page 52, in the last Number, have been at work upon the London and Greenwich Railway for more than twelve months; they have never been out of repair, nor failed in a single instance. The London and Birmingham Railway Company are now laying them down at the various stations upon the line.

1, Stafford-street, Bond-street. W. J. CURTIS.

LEVELLING.

In the published account of the Trigonometrical Survey of Great Britain, it is recorded, that the height of the top of the parapet of the north turret of the keep of Dover Castle was found, by levelling, by Lieutenant Hay, of the Royal Engineers, to be 465.8 feet above low water spring tides; and that the ground at Folkstone turnpike, deduced therefrom by computation, from vertical angles observed with Ramsden's then celebrated three feet theodolite, was 569.8 feet. It happened, in the spring of 1836, that Mr. F. W. Simms, in the course of some levelling operations for the South Eastern Railway Company, determined the height of the ground at the edge of the cliff close to Folkstone turnpike, above low water spring tide: the result he arrived at was 565.31, differing 3.49 feet from the above result, published in the "Philosophical Transactions for 1790." This result will appear remarkable to those who understand the nature of levelling by triangulation on a large scale, and the uncertainties unavoidable to such proceedings, arising from the refraction of the atmosphere, &c.; besides all which, the whole difference itself might have been involved in the different low waters taken by the two parties.

YORKSHIRE STONE QUARRY.

By R. D. Chantrell, F.R.I.B.A.

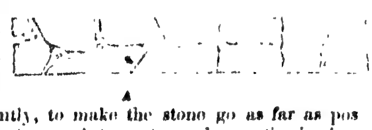
Description of the Mode of working the Springfield Quarry, near Leeds. Paper read before the Royal Institution of British Architects.

The Springfield Quarry is part of a hill, on the north-west side of Leeds, called Woodhouse Ridge. This quarry facing the south-east on the slope, or declivity of the hill, the general dip of the stone is S.S.E. in all the quarries in the neighbourhood of Leeds.

On breaking into the ground the soil varies from 1 to 2 feet in depth; below this is about 4 feet of marl and earth, mixed with small laminated fragments of stone; and at a depth varying from 5 to 7 feet from the surface, is the first bed of stone called rag; this is a coarse tough stone, rising in large layers from 6 to 9 inches thick, is raised by the lever, and to the sizes required for the first course or footings of buildings. In ordinary buildings it is customary to bed a course of this stone in mortar, about a foot broader than the walls; in lofty buildings two courses are laid, the joints crossed, and the two courses bedded solid upon each other in mortar, the lower course being broader than the one laid upon it. The method of cutting this stone into sizes is by what the quarrymen call "nicking." A line is drawn across the stone with a chisel lightly struck by a mallet; when this is done, the workmen strike on the joint with an iron mallet or hammer, extending the strokes from one end of the nick to the other, when the stone breaks vertically to the size marked. This mode applies also to the flag stone, which is usually the third bed or stratum. This is sold in the quarry at 6*d.* per foot cube.

Below the rag is the block stone, and for common walls (No. 1), and usually called wall stone. This may be separated in layers from 5 to 10 inches in thickness, is broken in random sizes, so as to form beds of 7 to 9 inches, and in lengths of 18 to 30 inches. The common walls, called double walls, are laid as Fig. 1; and the middle part is filled in with cuttings, called fillings, of which a sufficient quantity accumulates in the course of dressing the wall stones to suit the face of the piers; the joints of this work are crossed, and in every square yard of face a through or bond stone is introduced to bind the work together, as shown in Fig. 2.

Fig. 1.



The Yorkshire workmen frequently, to make the stone go as far as possible, will bring the stones nearly to a point as at A, when notice is given them of such defect; if not attended to, the architect should direct his clerk of the works to take off the point, as the work is not considered good if the joint is less than $3\frac{1}{2}$ inches.

The wall stones are usually dressed with a broad hammer, and have the appearance of rough tooling. This is called hammer dressing, and will vary from 3*d.* to 5*d.* per foot on the face beyond the cost of the material and walling. The specimen, No. 1, is of the best kind of hammer dressing.

The side on which it is written is termed bosting; this is done with a chisel, and is the first process from the rough stone after delivered from the quarry, in which state the protuberances are struck off only with a dressing hammer. Tooling is also practised upon wall stones, when they cost as much as common hewing or tooled work, 5*d.* to 7*d.* per foot for labour only. (At these prices the labour is understood to be at 4*s.* per day for masons, and 3*s.* for labourers, exclusive of master's profit, which in Yorkshire is 8*d.* for men, and 6*d.* per day for labourers.)

In Yorkshire the workmen calculate all wall-stone work by the rod of 7 yards, or 63 superficial feet. At a distance of one mile from the quarries in Leeds this sort of work is calculated to be completed, the contractor finding lime and sand stone, and carriage of materials, at from 30*s.* to 31*s.* 6*d.* per rod, or 6*d.* per foot, measuring the face of the wall.

This stone requires generally to be struck over or dressed on the beds, there being sometimes irregularities on them. In the seams a quantity of oxide of iron is found, and also mica, which is the case with all the stone of these quarries, and by which means, even in the ashler, the difference between the face and the bed is very perceptible. The block, or wall stone seam, is in this quarry about 10 or 11 feet thick, and the beds vary in thickness.

Beneath this is the laminated or flag bed, which is slaty, still more compact (No. 2). The beds are from $1\frac{1}{4}$ to 4 inches thick; $1\frac{1}{4}$ to $2\frac{1}{2}$ form the common paving, which is sold at the quarry at about 15*d.* per square yard. The wall stone is about 160 lbs. to the cube foot; the flag about 160 lbs. The lower bed of these is the ashlor (marked as such); this is about 148 lbs. to 152 lbs. to the cube foot, and is separated from the large block (or as is technically called "post") by wedges. The workmen cuts with the common wood mallet and short chisel holes at about 6 inches asunder, in the form of the wedges, of which a number are put in on the surface of the stone, and with long handled iron mauls the men strike each wedge inclusively the whole length of the piece to be separated, and endwise the same, the body varying from 10 inches to 14. When the stone is broken, which is almost invariably at right angles to the surface, it is separated on the bed by a large iron crowbar or gavelock, and this is either lewised or chained, and raised by the large crane or "gin," which is usually constructed to raise 14 or 15 tons. The wall stones are raised in cases or boxes open at the end, large enough to raise two or three tons.

In the quarry adjoining to this, there is a bed of large landings, extending near 70 feet in length, and 20 feet thick, which appear nearly level; the separate beds are very distinct, varying from 6 to 14 inches, and are solid as the ashler.

There is stone of the same description alternating to a depth of 50 feet from the surface, and it is the intention of S. T. W. Gawthorp, Esq. of Wakefield, the proprietor, to work it to the full depth, when I will transmit an account, with a section of the quarry, for the information of our Brethren of the Institute.

I shall send also some communication relative to the Grit-stone Quarries, from the materials of which I have erected several public buildings.

LITHOCHROMY.

Extract of a Letter from L. ve Kleuzé, of Munich, dated June 2, 1837, read before the Royal Institute of British Architects.

"I now send you the drawing of the peripteral temple executed by me in Munich Park, which, to the best of my knowledge, constitutes the first example of *lithochromy* in the present day. The stone is calcareous, very hard, of a yellowish white, and almost marble. The site is on a hill, in the midst of very lofty trees, which do not, however, reach midway the columns. The interior forms a semi-circular vault, caissoned, and likewise painted. The ground of the caissons (φατνοματα) is alternately red and green, and the ornaments of a ramified pattern are painted white upon these grounds. I say nothing about the exterior, because the drawing explains it in all its parts.

"The roof is covered with red coloured copper; the ornament above is of white shining metal, partly grounded with bright colours. The whole of these paintings and grounds is executed in the encaustic manner. I cannot tell you how justly the execution of this little monument increases and strengthens my conviction that *there is no classical architecture complete without the concurrence of colour*, and that such ornament forms an integral and adherent part. The non-employment places a monument in the category of a landscape drawing in Indian ink, or in bistre, opposite to one of Claude Lorraine's. Thank Heaven! this conviction is gaining ground considerably with us; I have already had occasion to construct a great polychrome edifice, a post-office. I am at the present time erecting a private mansion of the same kind; and thus this fine taste of antiquity is continually spreading.

"Your pit coal is, indeed, a terrible enemy to *lithochromy;* and you will, perhaps, *do right on that account alone* to keep to the English manner of building of the middle ages, which I was highly pleased with, and which I prefer in every respect on the score of beauty to the Germanic manner of the present day.

"I should fail were I to attempt to speak in general of the agreeable impression that I retain of your fine and great country, of what I saw there, and of the reception that I met with. Unfortunately, it has crossed my imagination like a beautiful dream, but the remembrance will never be obliterated from my heart nor from my mind.

"I congratulate the Institute upon the charter which his Majesty has been pleased to grant. It was certainly well advised to give an official character to a body that has already given proofs of what it will one day achieve, in the first volume of its memoirs, which I have read with great satisfaction.

"L. VE KLEUZE."

PARIS.

Extract from a Letter of M. Guenepin, dated November, 1837, to Thomas L. Donaldson, Esq., *Fellow and Honorary Secretary, R.I.B.A.*

"Our museum at Paris increases in size daily; the opening of some parts, which will complete the whole of the court of the Louvre, will soon take place. They will consist of the apartments of Henry III. and Henry IV., entirely restored in their primitive style; the 900 pictures of the Spanish school lately purchased; and also a numerous exhibition of original drawings of the great masters, which have been hitherto hidden from view in portfolios.

I must also tell you, that there has been erected in the half of the gallery of the Museum, which you well know on the side facing the river, a gallery in wood work, eighteen feet wide; this temporary gallery was first intended for a fête, which the king intended to give to the city of Paris, and to which 4,000 persons were to be invited. He also proposed to give to the Corporation a dinner, in return for that to which he had been invited some time previously at the Hôtel de Ville. These arrangements, however, having been relinquished, they were unwilling that the expenses incurred for this gallery should be lost, and there has been exhibited a long series of curious tapestries, comprising ancient royal chateaux, from the Gobelins and other manufactories; amongst them were some very remarkable ones, which dated farther back than Francis I.; several of them from the designs of Raphael, &c.; and you may judge somewhat of their number on hearing, that they occupied, on two sides, the whole length of the temporary gallery, which covers half the space between the Louvre and the Tuilleries. Great works and immense demolitions are in progress to enlarge the Hôtel de Ville, and to add thereto two wings, which will double its extent. The design is happily conceived, and this building will preserve the original character in which it was constructed.

The style of the transition between the Gothic and the revival, the embellishment of the Place Louis XV., and the Champs Elysées, are now going on. The Church of the Madonna de Loretto, constructed by Le Bas, our colleague, is quite completed, and open for public worship; it is entirely covered with paintings, and the ceiling is richly decorated with gilt coffers. This style of church, which is in imitation of the small Basilicas at Rome, was quite unknown at Paris, and although it does not quite conform with our religious habits in richness of decoration, contrasts strongly with the naked interiors of our churches; nevertheless, it has met with great success.

ON ARCHITECTURAL NOTATION.

By T. L. Donaldson, Esq., Fellow and Honorary Secretary Royal Institute of British Architects.

SHEWING THE DIFFERENT SYSTEMS ADOPTED BY ENGLISH WRITERS ON ARCHITECTURE, WITH THE SUGGESTION OF AN UNIFORM SYSTEM FOR GENERAL ADOPTION.

Paper read before the Royal Institute of British Architects.

A General Table showing the various modes of Notation used by different Writers on Architecture.

WRITERS ON GREEK ARCHITECTURE.	
1' . 2'' . 5	Stuart; Revett; Wilkins in one part of his Magna Grecia.
1′ . 2″ . 5	Wilkins; Deering in his Plan of the Temple of Ceres at Eleusis; Cockerell.
1 . 2 . 5	Bedford; Deering in the other Illustrations of the Inedited Antiquities of Attica.
1° . 2′ . 5″	Donaldson; Railton; Jenkins.
1 , 2 5'	Kinnaird.
WRITERS ON ROMAN ARCHITECTURE.	
1 ——— 2½	Adam in his Ruins at Spalatro.
1 „ 2 ′5	Taylor and Cresy.
WRITERS ON GOTHIC ARCHITECTURE.	
1ft. „ 2in. „ ½	Britton, A. Pugin, and A. W. Pugin.
1ft. 2½	Britton.
1 .. 2½	Mackenzie and Pugin; Britton.
1′ „ 2″½	A. W. Pugin, generally in Ancient Edifices of England.
1ft. 2″½	Walker.
1 , 2½	Caveler.

This is a subject to which few of our professional authors appear to have paid any attention; yet when we consider, that among a class of men professing an important branch of science—men supposed to be liberally educated, and in whose studies mathematics should form a prominent share—it seems extraordinary that nineteen authors from the time of Stuart to the present period have thirteen different ways of notation. This may be thought to be almost impossible. It will therefore be necessary, in the first instance, to establish this fact, as its absurdity may make you concur in advocating the necessity of one universal system of notation to be adopted henceforth by all English architects who may write on the Art.

We will commence with the authors who have written on Greek architecture, taking them in chronological order. Stuart and Revett stand at the head of this list, and both adopted the same method of notation. Thus, to express one foot two inches and a half, they wrote the numerals thus, 1' . 2'' . 5, placing a grave accent over the first figure representing the feet, two accents over the inches, but omitting any over the third figure, which was expressed decimally by a .5 as five-tenths, or half the inch. In addition there was a dot between each figure to render them still more distinct; it was, in fact, necessary before the five to make it express five tenths.

I would here make a remark, which, although not immediately pertinent to our subject, is not uninteresting to an architect. Every one is aware, that as all the dimensions of the orders in Stuart's "Athens" are given from the centre of the column, of course it was necessary to calculate every dimension, as, with the exception of the diameter, the various projections of the capital and entablature could not be taken from that imaginary line the centre, or axis of the column. Cockerell, Deering, and Bedford have also followed this system of calculating the projections of the different parts of the orders from an imaginary vertical axis of the column. Thus, not one of the dimensions is a pure dimension taken at once; and in fact all are false, for the axis of no column, it has since been proved, is vertical, which Stuart and Revett assumed it to be. But all the original dimensions taken by Stuart, I am assured by unquestionable authority, were taken in eighths, twelfths, or any parts of an inch which happened to be on the ruler with which he and his companions were measuring, being afterwards reduced, by calculation, to one uniform standard.

Mr. Wilkins follows next in chronological order, who, in some plates of his work on Magna Grecia, follows the system of Stuart and Revett; in other parts of the same work, he omits the accents altogether, and in his most recent work of "Prolusiones Architectonicæ," has adopted the acute accent instead of the grave, thus, 1′ . 2″ . 5, which method of notation is adopted also by Mr. Cockerell, in his illustrations of the Temple of Jupiter Olympius at Agrigentum, forming part of the supplementary volume to Stuart's "Athens."

The architects who furnished the illustrations to the "Inedited Antiquities of Attica," Messrs. Deering and Bedford, have different methods of expression, Mr. Deering following the latter mode of Mr. Wilkins in the plates of the Temple of Ceres at Eleusis; but in the other parts, his notation being the same as that of Mr. Bedford, omitting the accents altogether, and only using the intermediate dot, thus, 1 . 2 . 5.

The three next authors, who will be quoted in their chronological order as writers on Greek architecture, are myself, and Messrs. Jenkins and Railton, contributors to the supplementary volume of Stuart's "Athens," all of whom follow the same manner of notation, which is a new one, thus making a material alteration from the old method, 0° . 2′ . 5″, and being the first attempt to follow the system adopted in astronomy.

Mr. Kinnaird, the fifth contributor to the same work, adopts a different manner, placing the grave accent only over the decimal, thus, 1 . 2 . 5', with a single dot between each figure. Thus the twelve writers above-named have five distinct methods of notation.

We now come to the authors who have published works on Roman architecture, of whom there are only two in England who have given the dimensions of those ancient edifices in feet and inches; they are Adam, and Taylor and Cresy.

The volume of Adam upon the Palace of Diocletian at Spalatro, has the lengths thus noted, 1 —— 2½, the feet being separated from the inches by a long line; Messrs. Taylor and Cresy express the same quantity thus, 1 „ 2 ′5. There being no accent over the feet, which are divided from the inches by two strokes, and an accent marks the decimal.

We have several writers on Gothic architecture, whose valuable volumes afford as rich a variety of notation as the preceding; for there are as many methods as authors, but all agree in not using the decimal division of the inch, as shown in the table.

It is true, that this want of uniformity among the various architectural writers is not likely to lead to any material errors, as the great disproportion in the foot and inches suggests immediately the meaning of the peculiar notation; but it may be puzzling to the foreigner, who may consult their works, and who might not know whether the chain, the yard, or the foot were meant for the primary quantity. It is however ridiculous, evinces a want of precision and of uniformity of practice, as also an absence of scientific method, hurtful to their reputation as men of science.

Mr. Babbage, in his article on Notation, in the XVth volume of Brewster's "Edinburgh Encyclopædia," remarks, that "the great object of all notation is to convey to the mind, as speedily as possible, a complete idea of the operations which are to be or have been executed:" this is in reference to algebraic notation; but it becomes much more simplified, when we recollect that in architecture instead of operations we have merely to indicate lengths.

The same author lays down a system of laws for the adoption of symbols, which, by a slight alteration, is equally applicable to architectural as to algebraic notation.

"1. Since every thing is exhibited to the eye, the more compact and condensed the symbols are, the more readily will they be caught as it were at a glance.

"2. All signs of notation should be as simple in character and as few in number as the nature of the operations will admit.

"3. We must adhere to one notation for one thing.

"4. Analogy ought to be our guide in the formation of all new notations."

Your attention having been called to the variety of notation which exists in our professional writers, it may be expected that a system should be proposed, which shall unite the requisites contained in Mr. Babbage's rules. In the first place, then, let the feet and inches be separated by two strokes, in the same manner as in our monetary system the pounds are divided from the shillings and the shillings from the pence. This may be assumed to be unexceptionable, as all the writers above quoted agree that the division between the feet and inches should be marked by a line, a dot, or two strokes; besides which, the strokes more effectually divide the figures and render less probable any errors of the press. The parts of an inch, I propose, should be expressed decimally by a single dot, as all the writers on Greek architecture have adopted it without exception.

The next question to be settled, is as to the symbols which should indicate the quantities to which the numerals or figures act as co-efficients; that is, the feet, inches, and tenths; these are necessary in the event of only feet and inches being figured, or inches and tenths, in order to show at a glance the quantities intended to be expressed. It is proposed therefore to follow up the theory of analogy, by adopting the system of astronomers into their distinction of degrees, minutes, and seconds, and appropriating a small circle ° to the feet as the primary quantity, the single stroke or acute accent for the inches, and the double stroke for the tenths, thus, 1° „ 2′ . 5″; the acute (′) is to be preferred to the grave (') accent, as having the same inclination with the handwriting, and being consequently more readily written. It might be said that the double strokes over the decimal parts of the inch are rendered unnecessary by the adoption of the dot below; but it is better, perhaps, to retain them both, as rendering the system more complete, and the different quantities perhaps more distinct. The adoption of the ° from astronomical authors could never cause any confusion, for we never measure temples or even cities by degrees of miles, and the whole system would be rendered at once clear to the reader, if the scale were always placed at the bottom of the plate, and the different divisions carefully marked thereon.

This is the system which I have of late adopted in my own publications, and I have found no difficulty to arise from its use.

There are some among us, perhaps, who may not like innovations upon old practices, and who may possibly think themselves fettered by any one system being slavishly followed; that where all have been so free hitherto, all should remain unshackled from such generalizations. But surely we need not be withheld, by fear of innovation, from introducing a system which may rescue us from the reproach of want of scientific accuracy and precision of expression. Where all, even the highest names, have so differed, surely it is not unreasonable to suggest a uniformity of practice, in this respect, by the adoption of a system borrowed from a sister science, and which, it is hoped, practice will prove to be free from obscurity and difficulty. If it have not reason on its side, that will be a sufficient cause for its rejection.

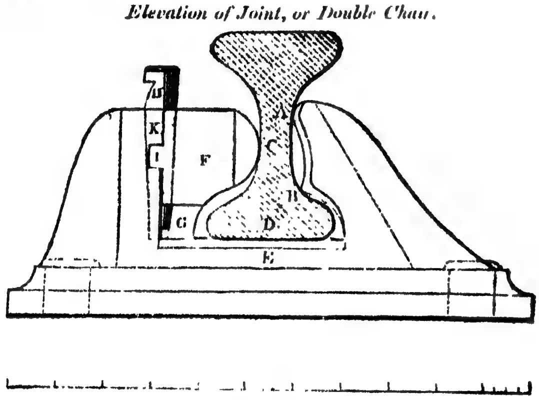
In the preceding remarks, allusion has been made merely to this system as to be adopted by writers on architecture. In making out working drawings for workmen to execute, the practical architect will, of course, adopt the method most consistent with his usual practice; and in cases where country workmen are employed, too great clearness and precision cannot be adopted; hence it is frequently necessary to express the feet and inches by letters, ft., in., in order to avoid those misconceptions to which workmen are liable, in respect to figures. But if the mode above recommended were generally in use, I see no difficulty that could arise, with the exception that I should re-

commend the parts of the inch to be expressed by ¼, ½, or ¾, and the intermediate divisions in eighths, as the rules commonly in use are so divided: the quantity above adopted would, therefore, stand thus—1°,,2'¼, and the double stroke be omitted, as unnecessary.

MR. BUCK'S CHAIRS FOR PARALLEL I RAILS.

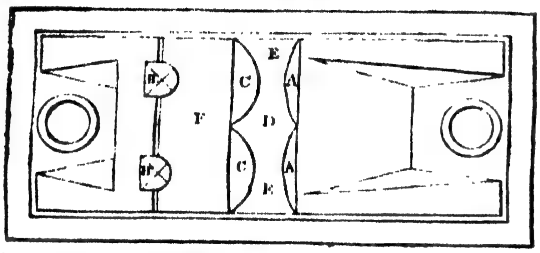
In the first place, it is necessary to observe, that however strong a rail may be, a certain amount of deflection between the points of support must result from the gravity of the passing load; therefore, in order that no motion may be communicated to the chair (which is essential to the maintenance of the road in good order), the connexion between the rail and chair must be such as to allow of the libratory motion arising from deflection, the rail being nevertheless firmly fixed upon its seat, incapable of rising therefrom, and prevented from lateral movement; at the same time it should be free to move longitudinally as much as the expansion and contraction of its length from variation of temperature may demand. To attain these ends is the object of Mr. Buck's contrivance.

Elevation of Joint, or Double Chair.



Scale of Inches.

Plan of Double Chair, the Rail being omitted.



The above engravings contain a plan and elevation of a "joint, or double chair." The same letters refer to the same parts in both figures. In the elevation of the chair, the rail is sectionally represented in its place; in the plan it is omitted. The seat of the rail in the chair at D is convex, being $\frac{1}{16}$ of an inch higher than at E E; this form permits the libratory motion of the rail on its seat at or near D, but is not peculiar to the chair I am now describing; it has been adopted in others, and is sometimes called "*cat backed.*"

That side of the chair which is next to the flanges of the wheels has contact with the rail at only two points, A and B; these are blunt points, produced by the side of the chair being formed into spheroidal knobs; A is in contact with the vertical rib of the rail, and B with the superior part of the lower web, where a tangent to its curved surface forms an angle of 45 with the vertical. On the outer side of the chair the rail is confined to its place by a cast-iron "*chock,*" or *filling-in piece*, F; that part of it next the rail is also made in a spheroidal form, and touches in a point only at C, about midway between A and B.

This chock has a step or foot G, resting on the seat of the chair, with a fillet I fitted into a corresponding groove in the chair, and the chock is wedged against the rail by means of the wrought iron key H; this key is passed into a mortice, one half of which is in the chock, and the other half in the chair, by which the key and chock are secured in their relative positions.

The mode of laying the rails in these chairs is as follows:—The blocks or sleepers, with the chairs affixed thereto, being previously laid in their places, the rails are dropped into the chairs (the width between A and K being sufficient for that purpose), and the chocks are then inserted horizontally, and wedged up by means of the keys H.

The effect produced by keying the chocks moderately tight against the rail at C, is to force the rail against the points A and B, and thereby, at the same time, down upon its seat at D, by the action of the point B, on the inclined surface of the rail in contact therewith. Now, it must be obvious, that so long as the key remains in its place, the rail is completely fixed laterally and vertically, and that it will be easily moved longitudinally when contracted or expanded by difference of temperature; also, that the libration of the rail, occasioned by deflection, will produce only a very minute rubbing at the points A, B, and C.

A notch is made on the outer side of the head of each key for the purpose of extracting it by the application of a lever or pinch-bar.

The joint, or *double* chair, differs from the intermediate or *single* chair, in being so much wider as to receive a double chock, with two knobs o each of which is keyed against the side of the end of one of the two which meet in the chair, the chock having two keys for that pur It may be objected that there is a chance of the keys getting lo and jumping out of their mortices when a train may be passing high velocity; the most satisfactory answer to which is, that upon the Lon and Birmingham Railway, about four hundred yards in length have been by way of experiment with these chairs, over which the passenger trains been running at velocities generally exceeding thirty miles an hour, with the least appearance of the keys working out; but, on the contrary, mos them have rusted fast into their places, and the points of contact have beco smooth, and a little brightened by the libratory motion, which is an indica that these chairs fully answer the purpose intended.

In a rail weighing sixty-five pounds per yard, with four feet bearings, space moved through at each deflection by that part of the rail which is contact with the point C, is $\frac{3}{1000}$ of an inch.

These chairs are designed as a substitute for those now very genera adopted for similar rails, in which wood keys, or filling-in pieces, from 5 to inches long, are used, and to which there are the following objections:—

First.—The keys, or filling-in pieces of wood, are liable to shrink in weather, and consequently to become loose and get out of their place

Second.—Instead of keeping the rails down upon the seat, they lift the from it, and a blow is produced by the passing load forcing the r down upon the seat of the chair.

Third.—In the joint chairs, one end of the key or filling-in piece is press down by the deflection of the rail, and at the same time the other end it is elevated, whereby the but-end of the contiguous rail, to which t wheel is advancing, is raised above the level of that upon which t wheel is at the instant pressing, and a shock is produced by the whe coming into contact with the but-end thus raised. This effect produced when there is sufficient room in the chair for the play of t rail; but when the rail tightly fills the chair, a rocking motion communicated to the chair, and by the chair to the block, or sleepe by which the road is rapidly put out of order.

Fourth.—The wood filling in pieces will prove less durable than the cast-ir chocks, even supposing the wood to be Kyanized."

RAILWAY CHAIRS.

SIR,—As Railway Engineering is now attracting a great portion of th public attention, perhaps the following simple suggestion may not be though unworthy of the notice of those engaged in facilitating the operations of thi popular branch of science. Your's, &c. C. L. O.

Experience having proved the importance of firmly fixing the rails into th chairs in all edge railways, and this operation being attended with some diffi culty, the following plan is respectfully submitted to the consideration o engineers, &c.

Fig. 1.

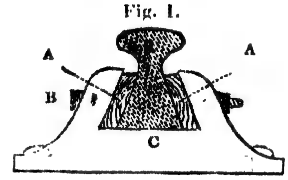


Fig. 2.

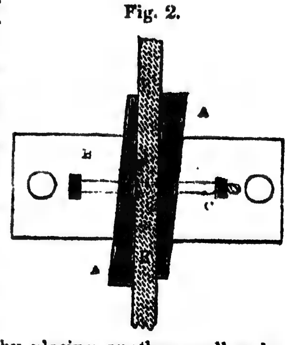


Fig. 1 represents the section, and Fig. 2 the plan, of an edge rail R, the flange of which is of a dovetailed form, with an opening in the chair C of a similar shape, only much larger; between the rail and the chair are two wedges A A of compressed oak, or other hard wood, drove in the reverse way to each other, as shown in the plan, Fig. 2. B is a screw-bolt, passing through both sides of the chair, through both wedges and rail, and screwed upon the other side of the chair, thereby preventing the sides of the chair from being forced too far apart by the wedges. The wedges might first be drove tolerably tight, and a hole bored through them carefully, to admit the bolt, which being screwed fast in, would compress the rail so effectually, as to entirely prevent looseness or shaking; the hole in the rail should be made larger than the bolt, to admit of its being accurately adjusted. By this method the rails might be adjusted with the greatest nicety, either to the right or left, in case the chairs were not very accurately fixed upon the sleepers, &c., as the wedges on either side could be increased or reduced in thickness as found requisite; the rails might likewise be slightly raised or lowered, by placing another small wedge underneath, either of wood or iron; and should the wedges at any time work loose, they might easily be replaced by fresh ones. Another advantage attending the adoption of this plan would be, that the wedges would yield slightly to the pressure caused by the expansion of the iron, and the whole might at any time be lightened by another turn of the screw-bolt; it must however be obvious, that the chairs must be of wrought-iron.

In the first instance, this plan might be attended with an increase of expense, but the advantages would, I think, greatly counterbalance it.

[In courtesy to our correspondent, we insert his letter and plan, which is ingenious, and have made such alterations as free it from those technical objections which would have otherwise been attached to it.—ED.]

PORT OF IPSWICH.

The importance of the town of Ipswich, in a commercial point of view, is sufficiently obvious to those who will look at its geographical situation, with the river Orwell navigable from the sea to the town, and of sufficient depth of water for vessels drawing 16 feet to approach within a short distance. The trade and commerce of the town is both extensive and prosperous, and, as a natural result, is on the increase. The merchants and influential persons of this place, taking the example of those of Liverpool, Bristol, and other flourishing ports, resolved upon examining if it were possible to render their port better suited to a growing commerce than nature had left it, and by affording greater facilities to trade, endeavour to win more of it to their market. The principle aimed at was the accommodation of a larger class of vessels than had hitherto been able to enter the port, so that the port might be adapted to a foreign trade, and to give as much facility to the shipping generally as the means would afford. The subject was under discussion by the principal inhabitants of the town for some time, and at length, resolving to call in professional assistance, they applied to H. R. Palmer, Esq., to examine and report upon the capabilities of the river to be converted into a port for the trading of vessels of 400 tons burthen. That gentleman made the necessary surveys and examinations in the following summer (1836), and having laid a plan before the proper authorities, which was approved of, an Act of Parliament was obtained during the last session to carry it into effect. From this plan it appears, that by making a new channel for the waters of the river Gipping, a wet dock can be constructed, by throwing an embankment across the present channel, which shall contain an area of 33 acres, and to have constantly 17 feet depth of water, which will be sufficient for the average build of vessels of 400 tons, although, from the difference in their form or build, many vessels of that tonnage draw considerably more. Mr. Palmer, in the last page of his Report to the authorities of Ipswich, has given a list of twenty-three vessels which have entered St. Katherine Docks, London, whose average registered burthen was 403 tons, and whose average draught of water was 16 feet 5½ inches.

The penning up that part of the river Orwell which is contiguous to the town, will form a capacious floating dock immediately connected with the numerous mercantile establishments already formed upon the banks, and the new channel, which is to be formed for the river in lieu of that which is to be enclosed, will prevent the tidal waters being impeded, and enable the land waters to move as freely as before. It is also proposed to construct a continuous quay around the basin or dock, in front of the present partially dilapidated wharfs, which shall be at least 30 feet in width. This will admit of a sewer being laid under its surface, having such a magnitude as to receive the drainage of the town, and this being continued to the external side of the embankment, will enable the soil to be freely carried off, without any deposit being formed in the dock.

The entrance lock is to be 140 feet long, and 30 feet wide, and the dock, as before observed, will contain 33 acres, being three acres more than the whole area of the London Docks, and exceeding by more than twenty acres the area of water in St. Katherine's Docks, in London.

The following is a copy of the estimate of the expenses, appended by Mr. Palmer to his Report:—

	£
Earthwork for the dock, the new channel for the river, and the deepening the present channel	27,000
Masonry, brickwork, timber, and iron-work, in the lock and its wing walls, including two pair of gates, and the machinery for working them—mooring posts and rings	6,500
Quay wall along the face of the town, from Peter's Dock to the commencement of Mr. Cobbould's Ouze, stone coping, oak fenders, sheet piling, concrete and puddling	14,000
Forming a quay 30 feet wide—a sewer, extending from Peter's Dock to the outside of the lower embankment, having man-holes, tide flaps, and gratings	3,500
	51,000
Contingencies, 10 per cent.	5,100
	56,100
Excavating channel near Downham Reach, to avoid the bend in the river, say (in the absence of more accurate data)	2,000
	£58,100

We understand that Mr. Palmer is now about to commence the above important works, the contract drawings being complete, and the preliminary arrangements for the purchase of land, compensation, &c., being in a forward state.

NEW CARRIAGES FOR THE GREAT WESTERN RAILWAY.

We have been favoured with a view of the new bodies building for the carriages of this railway by Mr. Davis, of Wigmore-street, and were highly gratified with their excellent build and accommodation; they are 12 in number, 8 of them being 18 feet long and 8 feet wide, and the remainder 21 feet long and 8 feet wide. They are fitted up in an elegant style, and have the appearance and almost the accommodation of the saloon of a steam-packet. The 18-feet carriages have 9 separate seats, resembling sofas; 5 on one side and 4 on the other, for 2 passengers each, separated by scroll-cut standards; the seats and backs are stuffed with horse-hair, and covered with handsome mohair velvet, and underneath is ample room for the passengers' luggage; the windows are over the back of the seats, and occupy the whole width in one sheet of plate glass, and furnished with spring silk blinds; the floor is covered with Brussels carpeting. The centre part of the roof or ceiling is raised to give headway, and is sufficiently high for a tall person to walk upright; on each side of the raised ceiling are copper gauze wire panels for ventilation, regulated by wood slides or shutters. At each end of the carriage is a small table for the accommodation of the passengers; this table is ingeniously contrived to turn upon its edge, when not in use, by means of a hinge-joint and double brackets turning upon two iron standards fixed to the floor. A lamp is provided at each end. No expense has been spared to render them worthy the name of first class carriages, and much credit is due to Mr. Davis for their excellent workmanship; it is estimated that they will cost 400*l*. each for the bodies only, exclusive of the carriages, which are being made by the engineers. The larger or 21 feet carriages are divided into 3 compartments, and fitted up similar to the others, except that the centre compartment will contain accommodation for 10 passengers, and those at the ends for 4 more each, forming small cabins, particularly suitable for families wishing to be by themselves.

THE NAVAL ARSENAL AT ALEXANDRIA.

When you enter the Arsenal of Alexandria, and behold a colossal establishment, with massive and handsome buildings, extending almost farther than the eye can reach—an establishment which is nowise inferior to many similar ones in Europe, and, in many points, is even superior to them; when you see the large ships which are there building, and immense magazines, filled with stores of every kind, sufficient completely to equip many others—and when you are then told, that only eight years ago the waves of the sea rolled over this very spot, and that the whole magnificent fleet which now fills the harbour was constructed in this arsenal, it really appears like a dream. If we further consider that these miracles of activity and sagacity have been performed by the inflexible *will* of a single man, in a land of the most complete barbarism, where, hands and arms excepted, there was scarcely one of all the requisites for such an undertaking, the astonishment of the spectator is doubled, and he is tempted to take literally the declaration in the Gospel, that faith is able to remove mountains. Has any European sovereign performed any thing similar in an equal space of time? I know of none—nay, had I not seen it with my own eyes, I should have believed such an undertaking to be wholly impracticable. Notwithstanding this, the bold spirit of Mehemet Ali does not yet rest, and he is now engaged in an undertaking almost equally gigantic, namely, to gain from the sea, where the bottom is covered with mud, to the depth of nearly a hundred feet, a basin capacious enough to contain the whole fleet, and from which the water may be drawn off at pleasure. The vast coffers which are building in the dock yard for the purpose of being sunk, are nearly as large as ships of the line. The possibility of success is almost universally doubted—Mehemet Ali alone does not doubt, for, like Napoleon, he knows no such word as "impossible." One of the foreign Consuls said, to dissuade him, "Your Highness throws your money into the sea." "Allah Kherim," replied the Viceroy good humouredly, "Why, I have been doing nothing else for many years past." Of course I have no intention of describing the arsenal in detail, as such establishments are sufficiently known, and all must, more or less, resemble each other. I mention only what particularly struck me; for instance, the admirable rope manufactory, which is equal in extent to that of Toulon, and is superior to it in arrangement. Here I saw, for the first time, the ingenious machine, invented by a Frenchman, for twisting the cables: the work produced appeared to me to be equal to the best English manufacture. In order and scrupulous cleanliness, as well in the magazines as in the workshops, the French arsenals are decidedly inferior to this. It is an excellent arrangement that, when the day's work is done, the workmen are obliged, before they leave the place, to hang up on the walls and pillars all the instruments that have been used during the day, in elegant figures, as is usually done for ornament in armouries. The advantage of this is, that the instrument cannot be mislaid or lost, and the theft is discovered at once. For this and many other judicious regulations, the arsenal is indebted to the unceasing care of General Besson, the worthy successor of the founder Cerisy, whose name will be held in eternal remembrance in Egypt. With the exception of the delicate nautical and mathematical instruments, very few articles of European manufacture are seen in the magazines. Arms, paper, clothing, linen, leather goods, cloth (partly of cotton), are all Egyptian. Three ships of the line were building in docks, which, in this climate, it is not necessary to roof over. In the lower walls, consisting of large hewn stones, several antique granite pillars and Egyptian figures are introduced, not without taste: this is unimportant; but what affords great pleasure is the solidity, the perfect order, the extreme cleanliness which characterize the whole, and charm the stranger, to whichever side he turns.—*Semilasso (Prince Puckler Muskau) in Egypt.*

ON THE EXPANSIBILITY OF THE DIFFERENT KINDS OF STONE.

Mr. Alex. J. Adie, Civil Engineer, has performed an extensive series of experiments upon different kinds of stone, as well as upon iron and upon brick, porcelain, and other artificial substances. The instrument employed was a pyrometer of a simple construction, capable of determining quantities not greater than $\frac{1}{30000}$ of an inch. The length of the substances generally employed was 23 inches. The general result of these experiments is, that the ordinary building materials of stone expand but very little differently from cast-iron, and that, consequently, the mixture of those materials in edifices is not injurious to their durability. The experiments from which the expansibility of the substances was numerically determined, were made between the limits of ordinary atmospheric temperature and that of 212°,

steam being introduced for that purpose between the double casing of the instrument.

The following results were obtained for the fractional expansion of the length, for a change of temperature of 180° Fahr.

Table of the expansion of Stone, &c.

	Decimal of length for 180° Fahr.
1. Roman cement	.0014349
2. Sicilian white marble	.00110411
3. Carrara marble	.0006539
4. Sandstone from the Liver Rock of Craigleith Quarry	.0011743
5. Cast iron from a rod cut from a bar cast 2 inches square	.00114676
6. Cast iron from a rod cast half an inch square	.001102166
7. Slate from Penrhyn Quarry, Wales	.0010376
8. Peterhead red granite	.0008968
9. Arbroath pavement	.0008985
10. Caithness pavement	.0008947
11. Greenstone from Ratho	.0008089
12. Aberdeen gray granite	.00078943
13. Best stock brick	.0005502
14. Fire brick	.0004928
15. Stalk of a Dutch tobacco pipe	.0004573
16. Round rod of Wedgewood ware (11 inches long)	.00045294
17. Black marble from Galway, Ireland	.00044519

Trans. of Roy. Soc. Edin.

DINNER AND PRESENTATION OF A PIECE OF PLATE TO ROBERT STEPHENSON, ESQ., ENGINEER-IN-CHIEF OF THE LONDON AND BIRMINGHAM RAILWAY.

On Saturday, the 23rd ultimo, a Dinner was given at the Dun Cow Inn, Dunchurch, on the occasion of presenting a splendid Piece of Plate to Robert Stephenson, Esq., as a token of the high respect and esteem in which he was held by the Members of the Engineering Department who were employed in the execution of the works on the London and Birmingham Railway, on the eve of their gradual separation, as the works are being completed.

About fifty-five gentlemen sat down to dinner, the whole of them (excepting Mr. Parker of London, and Mr. Carter of Birmingham, Solicitors to the Company) were connected with the Engineering Department of the Railway. Mr. Forster, the Resident Engineer at Coventry, took the chair, supported on his right by Robert Stephenson, Esq., and on his left by George Stephenson, Esq.; Lieut. Lecount, R.N., was the Vice-chairman. After partaking of a most excellent dinner, and the usual preliminary toasts being drunk, the Chairman, in a very eloquent speech of considerable length, presented the Plate, consisting of a Massive Silver Soup Tureen, beautifully mounted with a chased border and ornament in frosted silver, standing on a large Silver Salver corresponding with the Tureen; manufactured at Birmingham, and cost 120 guineas. On the body of the Tureen is the following inscription:—

TO ROBERT STEPHENSON, ESQ.
ENGINEER-IN-CHIEF
OF THE
LONDON AND BIRMINGHAM RAILWAY.
A Tribute of Respect and Esteem from the Members of the ENGINEERING DEPARTMENT, *who were employed under him in the execution of that great Work.*
Presented on the eve of their gradual separation,
DECEMBER 23RD, 1837.

On the opposite side of the Tureen the Names of the Subscribers are inscribed.

After the presentation of the Plate, the Chairman proposed the health of Mr. R. Stephenson, which was responded to enthusiastically by all the gentlemen present.

Mr. Stephenson, whose feelings were completely overpowered by the eloquent speech of the chairman, and the manner in which his health had been drunk, returned thanks in a very forcible and appropriate speech.

The Vice-chairman, in an animated and humorous speech, proposed the health of Mr. George Stephenson, which was drank with tremendous applause.

Mr. George Stephenson, in returning thanks, took occasion to impress on his hearers, the necessity there existed, in all the various branches of Engineering—for *perseverance*; and related an anecdote which occurred during his arduous and difficult execution of the great work, the crossing of Chat Moss, on the Liverpool and Manchester Railway, and which fully bore out his previous remarks. He stated, that after working for weeks and weeks in filling in material to form the road, there did not appear the least sign of their being able to raise the solid embankment one single inch—in short they filled in, and still it did not get any higher; his assistants also began to be doubtful of the success of his scheme. The Directors, too, were alarmed, and began to fear it was a hopeless task; so much so indeed, that a Board meeting was held on Chat Moss!! to decide as to whether Mr. Stephenson should proceed; and they had previously taken opinions of other Engineers, who had reported unfavourably upon the scheme: there is no doubt but that for the immense outlay that would have to be made had the scheme been abandoned and the line taken by another route, that the Directors "*were compelled*" to allow Mr. Stephenson to go on with his plan (who however had never for a moment doubted of his ultimate success). Determined, therefore, to persevere with his original scheme of execution, he ordered the works to proceed as before—and to the surprise of every one connected with the works, in six months from that day a locomotive engine and carriage passed over the very spot with a party of his friends to dine at Manchester. Mr. Stephenson also explained his reasons for the manner in which he had, in spite of adverse opinions, carried the work forward—he considered that a ship floats in water, and that the Moss was more capable of supporting weight than water; and he knew that if he could but once get the material to float it would succeed. How far his efforts were successful has been fully proved, not only to this country, but to the whole world, for that portion of the road which formerly consisted of such materials that not a cow could walk upon it, now forms the *very best part* of the road, and is a proud example of his genius; and the name of *Stephenson* will be known in after ages, as one of our brightest ornaments—as a man of science.

LONDON AND BRIGHTON RAILWAY COMPANY.

ENGINEER'S REPORT.

"*To the Directors of the London and Brighton Railway Company.*

"Gentlemen,—In consequece of your instructions, that I should in the first place take effective measures to have the whole of the enlarged plans and sections taken, to determine upon the exact line of railway, and to report if any improvements could be made on the Main Line of railway between Croydon and Brighton, and also on the Branch Line from Brighton to Shoreham, I beg leave to report to you, that I have been incessantly engaged with my assistants and surveyors, for nearly two months, in prosecuting the surveys, and in the examination of the country in every direction, and having completed the plans and sections on a working scale, it gives me great pleasure to report to you that the improvements of which the line of railway is susceptible can be made within the limits allowed by the powers of the Act of Parliament.

"The only material deviations are at Merstham and Balcombe, where it was desirable to make the tunnels straight; and as the consent of the parties to whom the land belongs has been obtained, these improvements can be effected.

"In consequence of the recommendation of Captain Alderson, of the Royal Engineers, the Parliamentary Committees of the Lords and Commons authorized the substitution of a tunnel at Merstham for open cutting, and the lengthening of the tunnels at Balcombe and Clayton; whereby, and by other improvements which I have made, I have been enabled to reduce the cuttings from 9,251,000 cubic yards of earth work, to 5,867,000 cubic yards, making a saving in cutting of 3,384,000 cubic yards; and by introducing arching in some places instead of continuous embankments, and availing myself of the advantages of the Parliamentary powers, I have reduced the embanking from 4,793,000 cubic yards of earthwork to 3,715,000 cubic yards, making a reduction in the amount of embanking of 1,078,000 cubic yards. The work is, therefore, one of ordinary extent.

"With these improvements, and allowing the most liberal prices for the work, the amount of my estimate for the main line, exclusive of contingencies, is reduced to 706,000*l.*; and allowing 10 per cent. for contingencies (amounting to 70,600*l.*) the total amount of my estimate is 776,600*l.*, 29,372*l* less than the Parliamentary estimate; which saving being added to the 70,000*l.* will give me nearly 15 per cent. for contingencies.

"No material alteration has been, or can be, made on the branch to Shoreham; the cost of this branch, I find on a revised estimate, amounts to 69,800*l.*

"These estimates, of course, do not include the value of the land or buildings.

"In my labours I have had the advantage of the assistance of Mr. Joseph Locke, who has taken great pains to make himself thoroughly acquainted with the whole of the main line and the branch to Shoreham; and has gone over the ground with me, and fully considered every thing that could bear upon the improvements of the line, the manner of execution, and the value of the work; and although I do not exactly agree with him upon the value of every part, we fully agree upon the principle and manner of carrying the work into execution. He will of course report to you his own opinion, as well as present you with the amount of his estimate.

"In conclusion I beg to state—

"That this line of railway is the very best which can be obtained between London and Brighton.

"That there is no necessity for any fresh application to Parliament.

"That the main can be executed for 805,972*l*, and the branch to Shoreham for 69,000*l.*

"That the main line can be completed and opened to the public in three years from the commencement of the work, and the branch to Shoreham in about eighteen months

"And with regard to the often-agitated question of the supposed necessity of cutting chalk with a slope of one to one, instead of the plan I propose to adopt, I have calculated the extra quantity of cutting that the slope of one to one would require, and I find that for both the Merstham and Clayton cuttings, it would only amount to about 1,000,000 of cubic yards extra, the cost of which would not exceed 10,000*l.*, which sum is the additional expense that such an extraordinary expedient would occasion, if resorted to, but I shall prove, in the execution of the work, that it is altogether unnecessary. I am, gentlemen, your most obedient humble Servant,

"*London, 7th Dec.* 1837." "JOHN U. RASTRICK."

"*To the Directors of the London and Brighton Railway Company.*

"Gentlemen,—I have had the honour to receive from your Secretary the following resolution of your Board, dated 31st of October last, namely,—

"'That Mr. Locke be requested to go over the line with Mr. Rastrick, and investigate his plans, sections, and estimates, and report his opinion upon the line, and the improvements that have been made upon it; and the sufficiency of the estimates, and the time in which the line can be completed.'

"In pursuance of this, I have accompanied Mr. Rastrick, with a view of forming an opinion of the merits of the several changes contemplated by him. I have, by this investigation, acquired a more intimate knowledge of the nature of the works required for this railway, and can now offer my remarks with more confidence than I have hitherto been enabled to do.

"My opinion of your line is already well known to you, and it may be unnecessary for me to repeat it. That opinion has undergone no change; and believing that Parliament has exercised a wise discretion in the selection of the direct line, I will content myself with stating that passengers can be conveyed upon it by locomotive engines at a safe and rapid speed—that the gradients will not exceed 1 in 264, nor the curves one mile in radius. The alterations made in the line since it was last under my notice are, in my opinion, judicious; and by the introduction of a tunnel at Merstham, and an extension of those at Balcombe and Clayton, much of the deep cuttings, so strongly objected to in the Committee, has been avoided, and yet there is no deviation of such an extent as to render another application to Parliament necessary.

"The question, however, of the practicability of your line is now considered to be set at rest—there is now no doubt but that the direct line can be made, and that, when made, it can be worked; and the ground being therefore so far prepared, I will proceed at once to the other branches of your inquiry.

"The working plans and estimates of Mr. Rastrick have been laid before me; and although I *might* agree generally with him as to the prices of particular works, I have thought it better to make my estimate entirely on independent grounds. With these materials before me, and with the advantage of my recent inspection of the line, I have estimated the cost of the works, including the excavations and embankments, bridges, tunnels, rails, chairs, sleepers, &c., and every other item belonging to the formation of the railway, and also the sum of 16,000*l.* for stations, and 30,000*l.* for management (but exclusive of the cost of the land and buildings), at the sum of 850,000*l.*, and the Shoreham Branch at 70,000*l.*; and I have no hesitation in expressing my belief that the works may be executed for these sums.

"I ought to observe, that, in forming my estimate, I have not been governed entirely by the propositions of Mr. Rastrick. There may be cases where his plans are superior to those which I might recommend; and, again, I might prefer a peculiar method of execution not approved of by him; but, under all these circumstances, the differences between us are so slight, and our estimates so nearly equal, as to give the assurance that we are not far from the truth.

"The line at Brighton still admits of a slight alteration. I have mentioned this to Mr Rastrick, who will, I doubt not, pay to the suggestion whatever attention it merits.

"The time in which the line may be executed need not exceed two years and a half.

"It is unnecessary for me to trouble you with the details of my calculations, either as to the cost or the time of execution. The aggregate amount is what more directly affects you, than the steps by which the conclusions are obtained; I may, however, be permitted to exceed the limits of my instructions, by venturing an opinion, that contractors are to be found to undertake the work for the amount, and within the time, I have stated

"On the Southampton Railway, heavier works, through more precarious materials, and at a less cost, are now being satisfactorily executed; and, with the experience of those works, I see no reason to apprehend difficulty in encountering those on your line. There is scarcely a district in England where the material is more favourable; and thus the contingencies, both as to cost and time, are rendered less vague than are usual in such cases.

"I wish not, however, to under-estimate the difficulties of your works; they are such as to require vigilant attention. But so much has been said and written on the subject of the Brighton Railway, that the public has been led to believe the formation of any line almost impossible; and I think it right to endeavour to place the subject fairly before you, in order that you may know that your works do not exceed those that have been successfully accomplished on other railways. I am, gentlemen, your obedient servant,

"*London, Dec 8th*, 1837." "JOSEPH LOCKE"

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL ACADEMY.

The president and members of this Institution assembled, as usual, on the evening of Saturday, the 9th of December, 1837, to distribute the medals adjudged at a general meeting on the 1st. Among the visitors we observed Lords Abinger and Lyndhurst, Lord Chief Justice Tindal, Sir John Rennie, Sir J. M'Gregor, R. Vernon, Esq., Samuel Rogers, Esq., and Philip Hardwick, Esq. The president, Sir M. A. Shee, commenced his address by adverting to the loss the Academy had sustained since their last meeting, by the demise of its illustrious patron, William the Fourth, whose loss (although supplied in the person of the beloved and amiable princess who now fills the throne) could not but be a source of the deepest regret to every person connected with the Academy and the Arts. Having concluded his preliminary observations, he proceeded to distribute the medals awarded to the various works of art, expressing the satisfaction felt by the members generally at the ability displayed by the students; but remarking with regret, the want of energy and enthusiasm in the class of original compositions. The distribution was as follows:—

To Mr. E. B. Morris, for the best original Painting, the Gold Medal, and the Discourses of the Presidents Reynolds and West.

To Mr. John A. Gifford, for the best original Design in Architecture, the Gold Medal, and Discourses of the Presidents Reynolds and West.

To Mr. J. Hayes, for the best Copy in the Painting School, the Silver Medal, and Lectures of Professors Barry, Opie, and Fuseli.

To Mr. Samuel Taylor, for a Copy in the Painting School, the Silver Medal.

To Mr. T. H. Harland, for the best Drawing from the Life, the Silver Medal, and Lectures on Professors Barry, Opie, and Fuseli.

To Mr. J. Waller, the Silver Medal was adjudged, but not given, in consequence of his having received a similar premium in the same class.

To Mr. Thomas Burton, for a Drawing from Life, the Silver Medal.

To Mr. Herbert Williams, pupil of Samuel Angell, Esq., for the best Architectural Drawing, the Silver Medal, and Lectures of Professors Barry, Opie, and Fuseli.

To Mr. W. Snook, pupil of Mr. Finden, for an Architectural Drawing, the Silver Medal.

To Mr. A. J. Ashton, pupil of Mr. Finden, for an Architectural Drawing, the Silver Medal.

To Mr. J. Rivers, for a Model from Life, the Silver Medal.

To Mr. W. Carpenter, for the best Drawing from the Antique, the Silver Medal, and Lectures of Barry, Opie, and Fuseli.

To Mr. H. Le Jeune, for a Drawing from the Antique, the Silver Medal.

To Mr. Nelson O'Neal, for a Drawing from the Antique, the Silver Medal.

To Mr. G. Nelson, for a Model from the Antique, the Silver Medal.

The President afterwards delivered an eloquent discourse to the candidates and students.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At the first Ordinary Meeting of the Session 1837 8, *held at the New Rooms*, 16, *Grosvenor-street, on Monday, December* 4*th*, 1837; J. B. Papworth, Esq., V. P., in the chair—The President announced for the Council that they had made application, through his Lordship the President, that her Majesty would be pleased to become the Patroness of this Institute, to which application the following reply had been received:—

"Downing-street, Aug. 8, 1837.

"My dear Lord,

"I have laid your letter of yesterday, together with the enclosure, before her Majesty this morning, and her Majesty consents to become the Patroness of the Incorporated Institute of British Architects.

"Believe me, my dear Sir,

"Yours faithfully,

"The Earl de Grey, &c. &c." "MELBOURNE."

James Medland, Esq., Architect, of Gloucester, was elected an associate. Letters were read from the Imperial Academy of Venice, the Royal Academy of Fine Arts of London, and the Manchester Architectural Society.

Several donations were announced, among which was a splendid volume of 93 original drawings by Panini, Bibiena, Oppenord, Moucheron, Benvenuto Cellini, and other celebrated artists, presented by Sir John Drummond Stewart of Scotland, through C. Barry, Esq., V. P.

John Blore, Esq. Associate, read the first part of a very interesting paper on the History of the English School of Gothic Architecture, which we regret cannot be transcribed to our pages, in consequence of its great length.

A communication was read from the Chevalier Von Kleuze, honorary and corresponding member at Munich, describing a Peripteral Ionic Temple, erected by him in Munich Park, and decorated with Polychromatic embellishments.

Messrs. Bunnett & Corpe, of Lombard Street, exhibited a Model of their patent revolving safety Shutters, and described the principle of their construction.

A second ordinary Meeting, on Monday, Dec. 18, 1837, P. F. Robinson, Esq., V.P., in the Chair. Sir R. Peel, Bart., was elected an honorary member; also several distinguished foreign architects were elected honorary fellows. Letters were read from Dr. Moller, of Darmstadt, accompanying a beautiful engraving of the Cathedral at Cologne; from M. Vaudoyer, of Paris, with several presents; and from M. Bolsato, Professor in the Fine Arts Academy, Vienna, all containing complimentary congratulations on the position taken by the Institute. The secretary announced, among other donations, seven views in Rome, from Mr. P. Thompson; "Fonthill Abbey," from Mr. Davy; Leoni's Works, from Mr. Chantrell; and Specimens from Mr. Hardwick. Mr. Godwin, Jun., presented two panels of stamped and painted Leather from Harrington house, lately pulled down. The second part of an interesting paper on English Architecture, by Mr. Blore, was read; a communication from Mr. Chantrell, of Leeds, was read, relative to the working of Yorkshire stone-quarries. Mr. T. L. Donaldson submitted some suggestions on the expediency of establishing an universal system of notation for architectural admeasurements. Mr. Cole furnished an interesting sketch and description of a Screen in Dartmouth Church, which is elaborately painted and gilded. Baron Wetterstedt described a new Metal for covering roofs; and Mr. T. Roe explained the construction of his Patent Water Closet.

The Meeting was adjourned to Monday, January 13.

ARCHITECTURAL SOCIETY.

This Society held their usual meeting at their Rooms on Tuesday evening, November the 21st, in Lincoln's Inn Fields. T. L. Walker, Esq., Honorary Treasurer, in the Chair. Several donations were received, and which the Secretary was requested to duly acknowledge. A paper of considerable interest on the subject of bricks was then read by J. Turner, Esq., on the conclusion of which the subjects for the sketches at the next meeting were announced. For Members—their opinions as to the best mode to be adopted for laying out the space before the National Gallery, called Trafalgar Square, to be accompanied by sketches or descriptions necessary to elucidate the same. For Students—a design for an Entrance Hall to a Nobleman's Mansion, with Staircase and Saloon.

Meeting 5th Dec., 1837.

F. H. Wyatt, V.P. in the Chair. Mr. Geo. Rutherford, Jun., was elected Student Member; and Mr. Manby, an Amateur Member.—Several donations were announced.

The subjects for the Sketches at the next Meeting were announced as follows:—Members' Subject, *Entrance to a Railroad Station.* Students' Subject, *Entrance-doorway to a Town House, without a Portico.* An interesting paper on the "Properties of Sound" was read by R. E. Philips, Esq., Member.

NOTICE TO STUDENTS.—MR. OWEN JONES (Member) has announced his intention of giving a Gold Copy of his Work on the Alhambra, to the Student who produces the most approved measured finished drawings and details of the Garden Front of the Travellers' Club House. MR. GEO. MAIR (Member) has announced his intention of *annually* giving an Architectural Work, to be awarded to the Student Member who produces, during the lessons, the greatest number of approved Sketches agreeable to the instructions of the Sketch Committee.

SOCIETY OF ARTS.

Mr. Aikin "On Calico Printing," No. 2.—After recapitulating the heads of the first Lecture on the same subject, the secretary proceeded to observe, that the chintz and palampore of India long continued to be the prototypes of European printed calicoes, in which the colours are distributed more or less in masses representing flowers and other natural objects. For these nothing but wooden blocks can be employed; as wood is the only material which with any convenience will allow of the insertion of pieces of felt, necessary in those parts of the pattern where a considerable quantity of mordant is required; and, therefore, even at the present day, for such kinds of patterns, block printing is universally practised. At length, in the change of fashion, stripes, sprigs, running foliage, and other simple and neat, but rather unmeaning patterns, raised in one colour, were introduced. It was soon found that such patterns could be represented with more delicacy and precision by copper-plate engraving than on wood. The plate and rolling-press were, therefore, introduced into the calico-printer's workshop, instead of the block and mallet. The spirit of competition, a rapidly extending market, and the ambition of "ridding" much work with a comparatively small profit, soon occasioned the substitution of the copper cylinder instead of the plate. The mordants, mixed with gum to the consistence of printer's ink, were distributed on the plate, first by hand, and then by machinery; which last, with the necessary modifications, was adapted to the cylinder. The time thus saved encouraged the calico-printers to give more precision to their machinery, by means of which, at the present day, they are capable of working two, and even three, cylinders, each distributing a separate mordant at the same time to the same piece of cloth, and at a rate which enables them to finish a piece in three minutes, and with a degree of precision, all things considered, truly surprising. Mr. Aikin, then, in a clear and simple manner, explained the chemical part of the process, by means of which such an almost infinite variety of tints and colours are produced; but, as it would be impossible, in the space allotted to this report, to follow the notes of the lecturer through the whole of these details—interesting as they are—and, as it would be equally impracticable to give a satisfactory analysis of them, we pass them over, and conclude by noticing the facility with which many compound or simple dyes on calico may be resolved or analyzed by the use principally of three re-agents, viz., bleaching liquor, solution of carbonate of potash, and of oxalic or tartaric acid. Indigo blue may be distinguished from Prussian blue by the action of bleaching liquor, which will destroy the indigo, but has no effect on Prussian blue; or by the use of carbonated alkali, which does not touch indigo, while it turns Prussian blue to an iron brown. All vegetable and animal colours yield to bleaching liquor; those that do not, are mineral or chemical colours: a colour, therefore, that is compounded of both kinds, may be resolved by the action of this substance. Chrome yellows are shown by their habitudes with carbonated fixed alkali, and by their becoming dark brown after the action of alkali, when touched with solution of an alkaline sulphuret. Iron yellows are soluble in tartaric acid, which chrome yellow is not. Greens, composed of yellow and blue, if both ingredients are vegetable, are discharged by bleaching liquor; if the yellow is chrome, and the blue is indigo, the action of carbonated alkali will discharge the yellow, leaving the blue, while that of bleaching liquor will discharge the blue, leaving the yellow. Brown, composed of oxide of manganese and madder, is resolved by bleaching liquor, which leaves the manganese, or by proto-muriate of tin, which dissolves the manganese.

In the museum were exhibited specimens of wheat, raised by cottagers, by means of dibbling, six inches apart. A memorandum, accompanying the specimens, set forth, that one individual began dibbling one grain of wheat to the square foot, which sprang up regularly, and yielded him forty-two bushels to the statute acre—a large return for 4lbs. 10oz. of seed. The specimens exhibited were prize specimens of the Battel and Hastings Horticultural Society, and measured five feet and a half in height, with ears proportionally large and full.

Minutes of Proceedings of the Institution of Civil Engineers, containing Abstracts of Papers, and of Conversation for the Session of 1837.

(Continued from Page 40.)

"March 21, 1837.---The President in the Chair.

"'*On the strength of Iron Girders, by W. B. Bray, A.Inst. C.E.*'

"In this paper the author states the rules which had been given by Galileo, Tredgold, and Hodgkinson, for calculating the strength of iron girders. He shows by a table that Galileo's rule must be utterly false when applied to girders having large bottom flanches. Applying this rule to two girders, one of which contains double the metal of the other, they ought to be of the same strength, whereas Mr. Hodgkinson's rule makes the former only one-half as strong as the latter. Tredgold gives no rule for the case of a large bottom flanche. Thus there appears great inconsistency in these rules, and a formula applicable to all cases is still wanted.

"'*On Mr. Hodgkinson's Experiments on Cast Iron Girders, by Thomas Webster, M.A.; Sec.Inst. C.E.*'

"The object of this paper was to detail the result of an examination of the above experiments, undertaken with the view of ascertaining whether those forms of beams recommended by Mr. Hodgkinson as requiring greater breaking weight have also a greater elastic weight than the more ordinary forms, with equal flanches at the top and bottom. The principle assumed by Tredgold (which also was the principle assumed by Dr. Young) is, that within the elastic limit the forces of extension and compression are equal; whereas Mr. Hodgkinson starts with the inquiry as to the law which connects the forces of extension and compression.

"Mr. Hodgkinson's experiments must be viewed as directed entirely to determining the breaking weights, and the earlier weights are not set down in many of the experiments. The weights and deflections first recorded are in many cases very near the elastic weight and point of permanent set, so that there is great difficulty in applying the principle already laid down for determining the elastic weight. But in some of the experiments, which have a long series of weights, it will be seen, on comparing the increase of deflection with the increase of weight, that this ratio changes from one of equality sooner in these forms than in those with equal flanches at the top and bottom. If then these beams with large bottom flanches do possess practical advantages, it may be from their allowing a violation of the elastic limit with comparative safety; this is a state of things, however, which ought never to be contemplated.

"April 4, 1837.---Bryan Donkin, Esq., V.P., in the Chair.

"'*Result of experiments made with a view to determine the best figure and position for wooden bearers, so as to combine lightness and strength; by James Horne, F.R.S.; A. Inst. C.E.*'

"The results of several experiments on wooden bearers of different sections are tabulated; together with the dimensions and weights of the pieces, and the nature of the fracture. The conclusion at which Mr. Horne arrives is, that a triangular prism placed with its base upwards is the strongest figure and position; that with an edge uppermost the weakest for a given quantity of material.

"The subject of the vibrations produced in the soil by the passage of Locomotives and Coaches was discussed, and several instances were mentioned in which the vibration of the soil was sensible at the distance of a mile and a half during an observation by reflexion. It was stated that the experiments recently made for determining the effect which the passage of the locomotives at a small distance might have on the observations at the Royal Observatory had not been conclusive; but that as no sensible effect could be produced on any observations but those by reflexion, no apprehension of inconvenience was entertained.

"It was also stated that a number of persons running down the hill in Greenwich park produces a slight tremor, which is quite sensible during an observation by reflexion, and that the shutting of the outer gate of the Observatory throws an object completely out of the field of the telescope.

"The comparative merits of the Single Pumping and of the Crank Engine for the purposes of raising water were discussed.

"Mr. Simpson stated that it was a generally received opinion that a Single Pumping engine would do one-third more duty than a Crank engine: but that having recently had a Crank engine altered by Messrs. Maudsleys and Field, and fitted with expansion valves, it did the most duty. The two engines were worked from the same boiler. The duty of the Crank engine was about thirty-two millions; it works to a fixed lift, which is in some respects advantageous. The duty of the Cornish engines is reported at ninety five millions, and an engine near London, in which the Cornish valves and system of clothing had been adopted, was doing a duty exceeding fifty millions.

"With respect to the Cornish engines, it was stated that their superior duty is due to the system of clothing; that although many persons had examined their duty, the calculations appear to be made from the contents of the working barrel; that the Cornish bushel is 90 or 94lbs. of a very superior coal, the London bushel being only 80 or 84lbs.; that notwithstanding the great duty done by the pumping engines, the crank engines in Cornwall are doing less duty than the crank engines in London.

"'*Notice concerning the Thames Tunnel. By Richard Beamish, M.Inst. C.E.*'

"Several attempts have been made in former years to effect a communication betwixt the opposite shores of the Thames by means of a Tunnel, all of which, however, failed. In 1798, Dodd proposed a Tunnel at Gravesend; and in 1801, Chapman projected one at Rotherhithe; and in 1807, Vazie commenced the construction of a shaft, 11 feet diameter, at a distance of 315 feet from the river. With Vazie was associated Trevethick, a man of great practical knowledge as a miner, and by indefatigable labour a drift-way 5 feet in height, 2 feet 6 inches in breadth at the top, and 3 feet at the bottom, was carried 1,046 feet under the river. In the spring of 1808, having first ascended from under a rocky stratum, though with a depth of at least 25 feet betwixt them and the bed of the river, the Thames broke in upon them, and not a single brick having been laid the work was irretrievaby lost.

"In 1823 the subject of a Tunnel was again agitated, and a company was formed to carry into execution the plans of Mr. Brunel. The first proceeding was to sink a shaft. Twenty-four piles with a shoulder on each were first driven all round the circle intended for the shaft. One side of a wooden platform or curb was then laid on *this* shoulder, whilst the other side rested on an iron curb, having an edge *below* to which it was attached. Through this curb ascended forty-eight wrought-iron bolts, 2 inches diameter, to the height of 40 feet, the height to which it was proposed to raise the shaft.

The regular building of the tower on the curb with bricks laid in cement was proceeded with, and yet farther bound together by twenty-six circular hoops of timber, half an inch thick, as the brick-work was brought up. At the top of the tower was placed another curb, and the long iron bolts passing through it, having their ends formed into screws, the whole was screwed solidly into one mass, and completed in three works. In a week after it was finished sixteen of the piles having been driven, two by two opposite each other, the whole structure was sunk half an inch, carrying down with it the remaining eight piles, on which it was brought to a rest uniformly and horizontally, thus permitting the sixteen piles to be abstracted by opening the ground at the back. The whole weight supported by these eight piles was about 910 tons (the weight of the shaft). Having been left for three weeks to dry, and gravel having been heaped under the curb, the remaining eight piles were removed, two by two, till the mass rested on a bed of gravel. The machinery, viz., the thirty-horse high pressure steam engine, with gear for raising the excavated soil, was now fixed on the top. The miners were placed inside, and by excavating from around the bottom, the whole descended by its own gravity.

" Mr. Beamish then describes the peculiar difficulties which were experienced previous to the first irruption.

" The chasm in the bed of the river, formed by the irruption of 1827, was stopped by bags filled with clay, with hazel rods passed through them; and the interstices filled by gravel. The irruption of 1828 was met by similar means, but the funds of the company not being then sufficient for proceeding with the work, the shield was blocked up with bricks and cement, and a wall 4 feet in thickness was built within the Tunnel.

" For seven years the work was abandoned, till in 1835 a Treasury loan was granted, subject to the condition that the most dangerous part of the Tunnel should be executed first. On resuming the works, the first object was to provide a drain for the water from the shield, for which purpose two reservoirs were formed under the middle pier, from which drifts were formed to the bottom of the great excavation and shield. The water was abstracted from the shield at the lowest point, and the pipes of two pumps worked by the steam engine being brought into the reservoir, all the difficulty of the drainage was overcome.

" The removal of the old and the introduction of the new shield was a work of no ordinary difficulty. The bricks and cement had, by the strong oxide of iron which the water contains, been converted into a mass harder than most rocks; and not less than 1616 of surface, 312 of which constituted the ceiling, had to be supported on the removal of the brick work previous to the introduction of the new shield. The means however adopted by Mr. Brunel, and which are described in the paper, were perfectly successful.

" April 11, 1837.---The President in the Chair

" Mr. Brunel gave an account of the Thames Tunnel. --Having described the nature and difficulties of the undertaking, and the previous attempts which had been made by others to effect a similar work, he explained by reference to sections the nature of the strata below the river. He had adopted the rectangular form of the present excavation, because the work would set better than if of any other form, and had a better sustaining surface. The necessity of supporting the ground, and of having a sufficient shelter, had led to the adoption of the shield respecting which so much had been said. The construction of this would be understood by conceiving twelve books set side by side on their ends. These would represent the parallel frames which, standing side by side, but not in immediate contact, fill up the excavation. Each frame is divided into three boxes or cells, one above the other; the adjustment of the floors of which, and other details, were minutely described by Brunel.

" Each frame is furnished with two large slings, by which it may derive support from or assist in supporting its neighbours; it has also two legs, and is advanced as it were by short steps, having for this purpose an articulation which may be compared to that of the human body. The frame rests on one leg, and then one side is hitched a little forward; then resting on the other leg, the other side is hitched a little, and so on. Hence the shield may be called an ambulating coffer dam, going horizontally.

" The brick-work is built in complete rings, and the advantages of this system of building had been fully proved by the fact of two dreadful irruptions having produced no disruption. Such was the violence of the irruption, that the brick-work had in one part been suddenly reduced in thickness by one-half, and in one place there was a hole as if pierced by a cannon-ball. At a few feet beneath them is a bed of quicksand 50 feet deep, and above them strata of most doubtful consistency, some of which goes to pieces immediately on being disturbed. Still, however, their progress is certain, and they only required patience to allow of the ground above them acquiring sufficient density. He found gravel with a mixture of chalk or clay extremely impervious to water; in some cases he contrived to let the water from the sand above them, and thus obtained ground of sufficient density. In their progress they were considerably annoyed by land springs, which produced cutaneous irruptions, and destroyed the finger nails of the workmen.

" April 18, 1837.---The President in the Chair.

" Mr. Brunel gave further explanations respecting the Tunnel. He explained the way in which the ground above them had suddenly sunk down, owing to the run of a lower stratum of sand. This running sand, which was a very great annoyance, consisted of *five* parts water and *one* sand. Bags of clay and gravel are not best where there are many stones; for the interstices do not become properly filled up; but in these cases the coarsest river sand is best; the water runs through at first, but soon stops; gravel and clay mixed are nearly impervious to water, but not so impervious as gravel and pounded chalk.

" Mr. Gibb stated that he had found bags filled with clay and tow-waste exceedingly impervious to water. Being called upon to rebuild a sluice in a place where piling, owing to the stony nature of the ground, was impossible, he had formed a coffer-dam by laying down bags full of clay and tow-waste, in tiers of four, formed on the top of each other to the surface of the water.

" The Ventilation of the Tunnel is effected by a pipe 15 inches square passing out under the fire-place of the steam engine boiler.

" ' *Description of a proposed Levelling Machine. By John Harrison.*'

" Mr. Harrison proposes to construct a machine which should make its own section of the country as it passes over it. This machine, of which the general appearance is like a caravan, is to be drawn on four wheels by horses, the machinery being moved by the wheels of the carriage. A section is generally made by marking on the base line the lengths; and on perpendiculars through these points the heights; and joining the points so marked off. But in this machine the section is to be made by the continued motion of a point acted on by two forces, one of which would carry it in a horizontal line uniformly with the space gone over by the machine, and the other vertically, according as the machine is rising or falling. The machine is thus divided into two distinct parts for effecting these purposes, and the way in which this may be practically effected is described in detail by reference to an isometrical drawing accompanying the paper.

" April 25, 1837.---The President in the Chair.

" The paper by Mr. Beamish, which had been commenced at a previous meeting (April 2), was concluded.

" Mr. Trubshaw presented to the Institution a model of the Centre employed by him in the construction of the Chester bridge.

" The peculiar features of this Centre, which is described in detail in the first volume of the Transactions, consist in the absence of horizontal timbers, the timbers being so arranged that their load is received end-ways, and in the lagging being supported over each rib by a pair of folding wedges.

" Mr. Trubshaw entered into the details of the construction and method of striking the Centre, explanatory of the account contained in the Transactions.

" Mr. Macneill explained a method which he had recently adopted of laying down the sections of Railways so as to show at once to the eye the position of the cuttings and embankments; and a scale being laid upon the section, their heights and lengths are at once known, in the same way as by measurement on a detached section. This method will be understood by conceiving the line of railway traced on a map of the country, and a coloured part above to represent where a cutting has been made, and a differently coloured part below where an embankment has been made. The outlines of these will show at once the dimensions of the cuttings and embankments; in engraved plans, he should represent the cuttings by lines, and the embankments by dots, or stipling. The usual sections would of course be used by engineers, but a section similar to this would convey at once all the information requisite for committees. Two or more lines being projected in this way, the reasons for selecting one in preference to the others would, in many cases, appear at a single glance.

" Mr. Macneill proposes also to adopt the terms acclivity and declivity with a rate marked after them. Starting then from the metropolis, or some principal town, all the ascents would be acclivities, and the descents declivities. Thus all the information generally required would be conveyed by the inspection of a single section.

EXTRACT FROM AN ESSAY READ BEFORE THE ARCHITECTURAL SOCIETY, ON TUESDAY, DEC. 5TH, 1837. BY R. E. PHILIPS, ESQ. ARCHITECT.

ON SOUND.

Sound is a term, of which, perhaps, it is quite unnecessary to offer any definition; but, when we consider it as a sensation, or still more, when we consider it as a perception, it may not be deemed superfluous to give a short description. Sound is that primary information which we obtain of external things by means of the sense of hearing. Those of the ancients, therefore, who taught that sounds were beings wafted through the air, and felt by our ears, should not even at this day be considered as awkward observers of nature. It has required the long, patient, and sagacious consideration of the most penetrating geniuses, to discover that what we call sound, the immediate external object of the sense of hearing, is nothing but a particular agitation of the parts of surrounding bodies, acting by impulse on our organs, and that it is not any separate being, nor even a specific quality inherent in any particular thing, by which it can affect the organ, as we suppose, with respect to a perfume, but merely a mode of existence competent to every atom of matter.

Most sounds, we all know, are conveyed to us on the bosom of the air; in whatever manner they either float upon it, or are propelled forward in it, certain it is, that without the vehicle of this or some other fluid, we should have no sounds at all. Let the air be exhausted from a receiver, and a bell shall emit no sound when rung in the void, for as the air continues to grow less dense, the sound dies away in proportion, so that at last its strongest vibrations are almost totally silent. Thus air is a vehicle for sound; however, it is not the only vehicle; that if there were no air, we should have no sounds whatever; for it has been found by experiment, that sounds are conveyed through water with the same facility with which they move through air. A bell when rung in the water returns a tone as distinct as if rung in the air. It appears from experiments by naturalists, that fishes have a strong perception of sounds even at the bottom of deep rivers; hence it appears not to be

very material in the propagation of sounds, whether the fluid which conveys them be elastic or otherwise. Water, which of all substances that we know has the least elasticity, yet serves to carry them forward.

But though air and water are both vehicles of sound, yet neither of them, according to some philosophers, seems to be so by itself; but only as it contains an exceedingly subtle fluid, capable of penetrating the most solid bodies; hence by the medium of that fluid, sounds can be propagated through wood or metals. By the same means deaf people may be made sensible of sounds, if they hold a piece of metal in the mouth, one end of which is applied to the sounding body. One thing however is certain, that whatever the fluid which conveys the note be—elastic or non-elastic—whatever sound we hear is produced by a stroke, which the sounding body makes against the fluid, whether air or water, the fluid being struck upon carries the impression forward to the ear, and there produces its sensation. Upon this point philosophers are agreed; but the manner in which this conveyance is made is still, I believe, a subject of doubt. Whether the sound is diffused into the air, in circle beyond circle, like the waves of water when we disturb the smoothness of its surface by dropping in a stone, or whether it travels along like rays diffused from a centre, somewhat in the swift manner that electricity runs along a rod of iron, are questions which have divided the learned.

Newton was of the first opinion; he has explained the progression of sound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of some insects, we shall have a tolerable notion of the progression of sound upon this hypothesis. The insect, for instance, in its motion first carries its contractions from the hinder part, in order to throw its fore part to the proper distance, then it carries its contractions from the fore part to the hinder, to bring that forward. Something similar to this is the motion of the air when struck upon by a sounding body; in the mean time, while the parts of the first range are thus falling back, the parts of the second range are going forward with an accelerated motion; thus there will be an alternate condensation and relaxation of the air during the time of one vibration, and as the air going forward strikes any opposing body with greater force than upon retiring, so each of the accelerated progressions have been called by Newton a pulse of sound, but we must bear in mind that these pulses move every way, for all motion, impressed with fluids in any direction whatsoever, operates all around in a sphere, so that sounds will be driven in all directions, backwards, forwards, upwards, and on every side; they will go on succeeding each other like circles in a disturbed water, or rather they will lie one on another in concentric shells, as we observe the coats of an onion. All who have remarked the tone of a bell while its sounds are decaying away, must form an idea of the pulses of sound, which according to Newton are formed by the air's alternate progression and recession.

As to the velocity with which sounds travel, this Newton determines, by the most difficult calculation that can be imagined, to be in proportion to the thickness of the parts of the air, and the distance of these parts from each other. He goes on to demonstrate, that if the atmosphere were of the same density everywhere, as at the surface of the earth, in such a case, a pendulum that reached from its highest surface down to the surface of the earth, would by its vibrations discover to us the proportion of the velocity with which sounds travel; the velocity with which each pulse would move, he shows, would be as much greater than the velocity of such a pendulum, swinging with one complete vibration, as the circumference of a circle is greater than the diameter; from hence he calculates that the motion of sound is 979 feet in one second; but this not being consonant to experience, he takes another consideration, which destroys entirely the rigour of his former demonstration, namely, vapours in the air, and then finds the motion of sound to be 1,142 feet in one second, or near 13 miles in a minute; a proportion which experience has nearly established.

Various have been the objections that have been made to the Newtonian system of sounds, and many are the theories of sound. We find the following explanation given by the late Dr. Matthew Young, in its defence:—

"1. The parts of all sounding bodies vibrate according to the law of a cycloidal pendulum, for they may be considered as composed of an indefinite number of elastic fibres; but these fibres vibrate according to that law.

"2. Sounding bodies propagate their motions on all sides in directum, by successive condensations and rarefactions, and successive goings forward, and returnings backward of the particles.

"3. The pulses are those parts of the air which vibrate backwards and forwards, and which, by going forward, strike against obstacles. The latitude of a pulse is the rectilineal space through which the motion of the air is propagated during one vibration of the sounding body.

"4. All pulses move equally fast. This is proved by experiments, and it has been found that they describe 1,070 Paris feet, or 1,142 London feet in a second, whether the sound be loud or low, grave or acute."

Monsieur Sauveur, by some experiments on organ pipes, found that a body which gives the gravest harmonic sound, vibrates twelve times and a half in a second; and that the shrillest sounding body vibrates 51,100 times in a second. At a medium, take the body, which gives what Monsieur Sauveur calls his fixed sound, it performs 100 vibrations in a second, and, in the same time, the pulses describe 1,070 Parisian feet.

The method of calculating sound in its progress is easily made known. When a gun is discharged at a distance, we see the fire long before we hear the sound. If, then, we know the distance of the place, and know the time of the interval between our first seeing the fire and then hearing the report, this will show us exactly the time the sound has been travelling to us.

For example, suppose you see the flash of a gun in the night at sea, and tell seven seconds before you hear the report, it follows, therefore, that the distance is seven times 1,142 feet—that is, 24 yards more than a mile and a half. In like manner, if you observe the number of seconds between the lightning and the report of the thunder, you know the distance of the cloud from whence it proceeds. Corrected by the experiments of various observers, the velocity of any impression transmitted by the common air, may at an average be reckoned 1,130 feet in a second. Derham has proved by experiments, that all sounds whatever travel at the same rate. The sound of a gun, and the striking of a hammer, are equally swift in their motions. The softest whisper flies as swiftly, as far as it goes, as the loudest thunder.

To these axioms we may add the following:

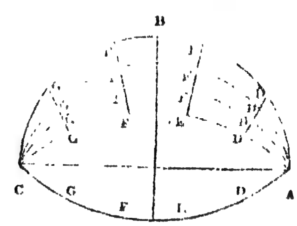
Smooth and clear sounds proceed from bodies that are homogeneous, and of an uniform figure, and harsh or obtuse sounds from such as are of a mixed matter, and irregular figure.

The velocity of sounds is, to that of a brisk wind, as fifty to one.

The strength of sounds is greatest in cold and dense air, and least in that which is warm and rarefied. Every point against which the pulses of sound strike, becomes a centre, from which a new series of pulses are propagated in every direction. Sound describes equal spaces in equal times.

Sound, like light, after it has been reflected from several places, may be collected in one point, as into a focus, and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whispering gallery is constructed.

The form of a whispering gallery must be that of a concave hemisphere, as ABC, and if a low sound or whisper be uttered at A, the vibrations expanding themselves every way will impinge on the points DDD, &c., and from thence be reflected to EEE, and from thence to the points F and G, till at last they all meet in C, where, as we have said, the sound will be most distinctly heard. When we speak in the open air, the effect on the tympanum of a distant auditor is produced merely by a single pulse; but when we use a tube, all the pulses propagated from the mouth, except those in the direction of the axis, strike against the sides of the tube, and every point of impulse becoming a new centre, from whence the pulses are propagated in all directions, a pulse will arrive at the ear from each of those points; thus, by the use of a tube, a greater number of pulses are propagated to the ear, and consequently the sound increased. The confinement of the voice, too, may have a little effect, though not such as is ascribed to it by some, for the condensed pulses produced by the naked voice freely expand every way; the substance of the tube likewise has its effect, for it is found, the more elastic the substance of the tube, and consequently the more susceptible it is of these tremulous motions, the stronger is the sound.



An echo is a reflection of sound striking against some object, as an image is reflected in a glass; but it has been disputed what are the proper qualities in a body for thus reflecting sounds. It is generally known that caverns, grottos, mountains, and ruined buildings, return this reflection of sound; we have heard of many extraordinary echos, and no doubt most of us have experienced many ourselves.

It has been already observed, that every point against which the pulses sound strike, becomes the centre of a new series of pulses, and sound describes equal distances in equal times; therefore, when any sound is propagated from a centre, and its pulses strike against a variety of obstacles, if the sum of the right lines drawn from that point to each of the obstacles, and from each obstacle to a second point be equal, then will the latter point in which an echo will be heard.

Now it appears from experiments, that the ear of an excellent musician can only distinguish such sounds as follow one another at the rate of nine or ten in a second, or any slower rate; and therefore, for a distinct perception of the direct and reflected sound, there should intervene the interval of one ninth of a second; but in this time, sound describes nearly 127 feet, and therefore, unless the sum of the lines drawn from each of the obstacles exceeds the interval by 127 feet, no echo will be heard. Hence all the points of the obstacles which produce an echo must lie in the surface of the oblong spheroid, generated by the revolution of this ellipse round its major axis. However, an echo may be heard, in other situations, though not so favourably, as such a number of reflected pulses may arrive at the same time at the ear, as may be sufficient to excite a distinct perception. At the common rate of speaking, we pronounce not above three syllables and a half—that is, seven half syllables in a second; therefore, that the echo may return just as soon as three syllables are expressed, twice the distance of the speaker from the reflecting object must be equal to 1,000 feet; for, as sound describes 1,142 feet in a second, six-sevenths of that space, that is 1,000 feet nearly, will be described, while six half, or three whole syllables are pronounced—that is, the speaker must stand near 500 feet from the obstacle, and, in general, the distance of the speaker from the echoing surface, for any number of syllables must be equal to the seventh part of the product of 1,142 feet, multiplied by that number. In churches we never hear a distinct echo of the voice, but a confused sound, when the speaker utters his words too rapidly, because the greatest difference of distance between the direct and reflected courses of such a number of pulses as would produce a distinct sound, is never in any church equal to 127 feet, the limit of echos.

Monsieur De la Grange has also demonstrated, that all impressions are reflected by an obstacle, terminating an elastic fluid, with the same velocity with which they arrived at that obstacle.

When the walls of a passage, or of an unfurnished room, are smooth and

perfectly parallel, any explosion, or a stamping of the foot, communicates an impression on the air, which is reflected from one wall to the other, and from the second again towards the ear, nearly in the same direction with the primitive impulse; this takes place as frequently in a second, as double the breadth of the passage is contained in 1130 feet, and the ear receives a perception of a musical sound thus determined in its pitch by the breadth of the passage. On making the experiment, the result will be found to correspond. The appropriate notes of a room may be readily discovered by singing the scale in it, and they will be found to depend on the proportion of its length or breadth to 1130 feet.

In having thus given but a vague and perhaps unsatisfactory account of the science of acoustics, as connected with architecture, I trust my hearers will admit that there is much which strongly appertains to the profession to which we have the honour to belong. In our churches, in our theatres, in our public halls, sound is a matter of deep consideration, or ought to be. To fulfil the intentions intended, therefore, the words of Vitruvius, as to the architect being some little acquainted with music, is not altogether a fallacy, but rather a desirable object. Let us then anticipate a new era in our architecture; let us hope it will be held up on the classic grounds of Oxford and Cambridge, as the necessary harbinger of a liberal education.

AN ESSAY ON BRICKS,

Read by J. Turner, Esq., before the Members of the Architectural Society.

"Architecture," our great master, Vitruvius, says, "is a science arising out of many other sciences." Indeed, so numerous are they, and so interesting is the study of each, and of the arts connected with them, to an Architect, that I feel little apology is necessary in the selection of the subject of this Essay.

The universal use of brick, as a material for building, at the present day, its unparalleled applicability, and its wonderful resistance to the ravages of time, have induced me to collect a few records of its antiquity, the material used in its manufacture, and the method of building with it in this and other countries.

It appears that after the Deluge, and before the time of Nimrod, the inhabitants of Assyria lived chiefly in tents and caves. The great Prince, Nimrod, united his subjects in cities, and the first city founded, and known in history, is Babel, wherein we find that immense structures were raised, from the facility of preparing brick by mere solar heat; and however improved that city may have been by Semiramis, wife of Ninus, the erection of the celebrated Tower is generally ascribed to Nimrod, and of which the Birs Nemroud is by some supposed to be the remains. At the Birs Nemroud, are brown and black masses of brickwork, more or less changed into a vitrified state. These masses, however, are found on the summit of the pile, and were evidently vitrified by subsequent conflagration, thought to have been formed by the immense heaps of wood burnt upon the tops of hills in the ancient fire worship; piles of such magnitude, that they were loftier than the hill, and were visible at the distance of 1000 stadia, and heated the atmosphere to such a degree, that the spot could not be approached for several days.

The Babylonian bricks are found to be of two kinds; the sun dried and kiln-burnt. In countries where the sun is powerful, and it seldom rains (in Chaldea not for eight months in the year, occasionally not for two years and a half together), the sun-dried bricks were sufficient for most purposes.

The first walls of Mantinea wholly consisted of them, and they were found to resist warlike engines better than stone.

The bricks are found to be composed of pure clay, and although only baked in the sun, they are so solid and compact as to ring, if placed on the edge, and gently stricken by any metallic body; they were shaped in moulds, supposed to be of wood, having figures and inscriptions, and were beaten up with straw or rush to increase cohesion, and bound in their courses by layers of mortar and reeds.

The curiosity of the bricks at the Birs Nemroud (says Mr. Rich), both sun-dried and kiln-burnt, is the inscription; the language is Chaldee, the system of letters alphabetical, not symbolical, and each figure a single letter, not a compound character or word.

It was customary to inscribe astronomical observations on bricks or columns, and probably these inscriptions were of a talismanic character, for the inscribed parts were always turned down, so that the writing might not be seen or read. Sometimes both face and edge were inscribed, sometimes only the edge; and this is the more rare and valuable of these bricks; some contain 10 lines in an upright column, and some are stamped across to the angles of the bricks.

The kiln-burnt bricks were of far superior induration; they compose the piers and arches of a bridge mentioned by the prophet Baruch, and still remaining; some of them were varnished, and adorned with figures; and they have been found disposed in mosaics, in the figure of a cow, the sun, and moon. The colour is a bright red or pale yellow; in the unburnt, that of stone. The sizes vary from 12 to 13 inches long, 3 or 4 inches thick; the largest known, however, measure 19¾ inches square, and 3½ inches thick, with the written characters along the sides. Some of these bricks have been found of a cylindrical form, inclining to a barrel entasis; they are made of the finest furnace-baked clay, and inscribed with a small running-hand; from the perforation of some, they are presumed to have been worn as amulets or talismans.

In the cement used, lime appears to have been deemed most fit for the upper parts of a building. Captain Mignan, speaking of the Birs Nemroud, says the bricks are 13 inches long by 4½ thick, and are cemented together with a coarse layer of lime, upwards of an inch deep; they are not level, but slope gently from the north face towards the east, and from the east towards the south. Bitumen, which is to be found at the base of most of the ruined structures, is likewise discernible in the pile; none is to be found in the upper portion.

In some instances, neither lime nor bitumen were used, only simple clay. As to the layer of reeds, Herodotus says, "that they were placed at every thirtieth course;" but modern travellers find them at every sixth, seventh, and eighth course, in Aggarkuff, and at every course in some buildings in Babylon.

In Egypt, in such parts as were subject to the inundation of the Nile, towns could not be founded except upon artificial substructures made above the level of its rise; and from Herodotus we learn that the Ethiopians, when they seized Egypt, killed none of the conquered, but employed them in raising heaps of earth; and these artificial superstructures, Sir William Drummond observes, were composed of rubble, surrounded with enclosures built of bricks. Pliny gives us the statement of some old writers, who say, that in the construction of the Pyramids, causeways were made of bricks made of mud, which, upon completion of the work, were distributed among the private houses.

It appears, however, that the Egyptians not only used that material as an accessary to erecting those enormous piles, but also built some with it; and Pococke thus describes one he met with:—"About two miles to the east of the last great Pyramid (at Saccara), on lower ground, and near the east edge of the mountain, is the Pyramid built of unburnt brick. I observed, on the north side, the bricks were laid lengthways from north to south, but not every where in that direction; however, I took particular notice that they were not laid so as to bind one another; it is much crumbled and ruined; it is 157 feet on the north side, 210 feet on the west, it being much broken away on the east and west sides; it is 150 feet high."

And it appears from his and other travellers' accounts since, that no improvement has taken place in the manufacture of this important material, where in eastern countries it still continues to be made, and used as in its most primitive state of invention, many of their houses being built of unburnt bricks made of earth and chopped straw dried in the sun.

In tracing this subject to more classic ground, Greece,

"Where demi gods appeared, as record tell,"

we find that the native materials of the country led men to form their superstructures in accordance with the gifts of nature, which in a great measure superseded all auxiliaries, and the style of their architecture rendered stone or marble more convenient and effective; but it was not altogether rejected in their buildings. And here we have that consideration given to their form and size as should make the work executed with them appear not only more agreeable to the sight, but render it also more solid in construction. Hence Vitruvius tells us the Greeks had three kinds of brick; two sorts only were used in public buildings; each sort had half bricks made to suit it, so that when a wall was executed, the course on one side of the face of the wall shows sides of whole bricks, and being worked to the line on each face, the bricks on each bed, bond alternately over the course below; and so particular were they to having their bricks properly seasoned, that Vitruvius says, the inhabitants of Utica allowed no bricks to be used in their buildings that were not at least five years old, and also approved of by a magistrate; and the example of its application mentioned by him is that part of the wall at Athens towards Mount Hymettus and Pentilicus and the Temples of Jupiter and Hercules, in which the cells are of brick.

The remains of walls and buildings in Greece, executed with this artificial material, are so few at the present day, and so lightly described in the works of those scientific men who have visited that interesting country, that we are left in some doubt, whether they were used sun-dried or kiln-burnt, or both, as was the custom in Persia, Egypt, and other countries; for in the chapter, wherein Vitruvius mentions them, he does not state that they were burnt, but rather leads us to suppose they were made according to his rules. In that ill-fated city Pompeii,

"Far more than Sparta, this in Venus' grace,
"And great Alcides, once renowned the place."

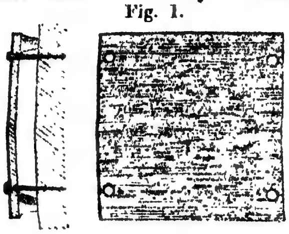
Wherein so much has been discovered relating to the architecture and the arts generally, and which indeed forms, as it were, the *link wanting* to connect our perfect acquaintance with the customs of Rome and Greece, the use of brick became a very necessary and useful appendage to their materials in building, and not only did the nature of the soil prove favourable for its manufacture, as did brick become of indispensable and universal service in the construction of their walls and buildings, forming, as it were, a bond to the shapeless pieces of rubble work of which they composed some of their walls, and giving solidity to others built of either squared volcanic stone, ferruginous scoria, and tufa; indeed, few of the public buildings of that city were erected without its application, and the eye of the traveller, upon first entering the forum, is struck with these buildings from the high dark masses of brick, contrasting with the verdant mountains at their back, and the low limy buildings around them.

The bricks are united together by mortar, or puzzolano, and in some of the walls it is found to be very bad. The thickness of the walls of houses very seldom exceed 18 inches, and is oftener less; their preservation, indeed, seems rather owing to the stucco on the surface, than the mortar used in building them.

The roof of the Basilica, or Court of Justice, the largest building in Pompeii, was supported by a peristyle of 28 Ionic columns, which are very

curiously constructed of bricks, moulded so as to form the volutes to the columns, the exterior of which was afterwards covered with cement; and here I must call your attention to a mode they had of forming a more perfect and dry wall, wherever the quality of the building rendered it necessary, or where they required a more perfect surface to paint upon; in the enclosure walls of the Peribolus of the Temple of Venus, and the wall in the public baths, the internal face is covered by a course of tiles fixed to it by ties or nails, and between which and the wall is a hollow space produced by four projecting feet on the back of the tiles; thus a circulation of air was kept up behind the tiles and the painted stucco, the face remaining uninjured by damp; a method which might be adopted at the present day instead of using battens to our walls, which are subject to the dry rot, affording in my mind a notion that the same would not be inapplicable to the purposes of ventilation.

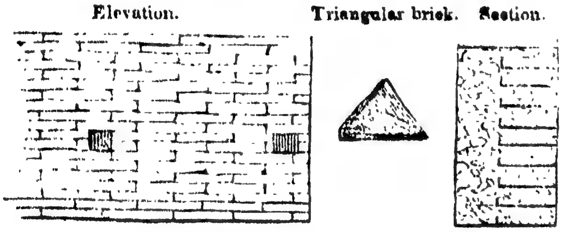
Fig. 1.

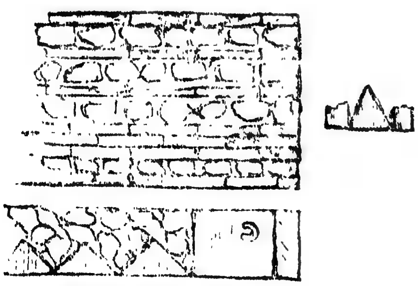


Searching the remains of "the gorgeous palaces, the cloud-capp'd towers," of ancient Rome, we discover them handed down to us built with this almost imperishable material, brick, both *sun-dried* and *kiln burnt*; but most of the old houses of Rome were built with the first kind. They had several sizes of bricks, one of which they called bipeda, or two Roman feet long; another, didoron, about six inches broad and one foot long; in Palladio's time, artificial stone or bricks were called "quadrels," and, according to Pliny, those chiefly used were a foot and a half long and a foot broad, which also agrees with the size mentioned by Vitruvius, though Alberti says, "we see in some of their buildings, and especially in their arches, bricks, two feet every way," but he afterwards remarks, that in several of their structures, particularly in the Appian way, were several different sorts of bricks, some smaller and some bigger, and he mentions having seen some not longer than six inches, nor broader than three, and one inch thick; but these were chiefly used in their pavements and edgeways; and Palladio observes, bricks may be made bigger or smaller, according to the nature and quality of the building, and the use to which they are designed; they also made bricks of other forms than those enumerated. "I am best pleased," says Alberti, "with their triangular ones, which they made in this manner: they made one large brick a foot square and an inch and a half thick; while it was fresh, they cut it in two lines crossways from one angle to the other, which divided it into four equal triangles. These bricks had the following advantages: they took up less clay; they were easier to dispose of in the kiln and to take out again; they were more convenient for working, because the bricklayer could hold four of them with one hand, and with a small stroke divide the one from the other; when placed in the wall, they appeared like complete bricks of a foot long. Some of these bricks are to be seen in the walls of Rome, particularly that part built by the Emperor Aurelian."

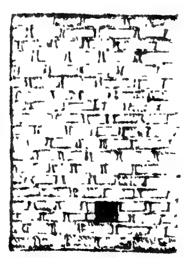
Fig. 2.—From the Palace of the Cæsars.
Walls faced with Triangular Bricks.

Elevation. Triangular brick. Section.





Elevation and Plan.
From the Circus of Caracella.



Elevation.
From the Basilica of St. Paul.

And Hope speaks of bricks being made in the form of lozenges, and some were even moulded, or were, after being cemented together in regular layers, carved out into every variety of architectural ornament, as we see at Rome, in the remains of the Amtheatrum Castrense, of the Temple of the God Ridiculus, and in another building, where even the capital and foliage of the Corinthian order are cut out of solid masses of brickwork.

Capital at the Temple of the God Ridiculus.

Fig. 3.—Profile.

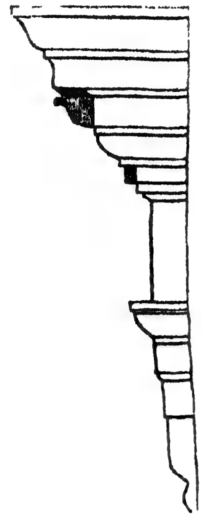
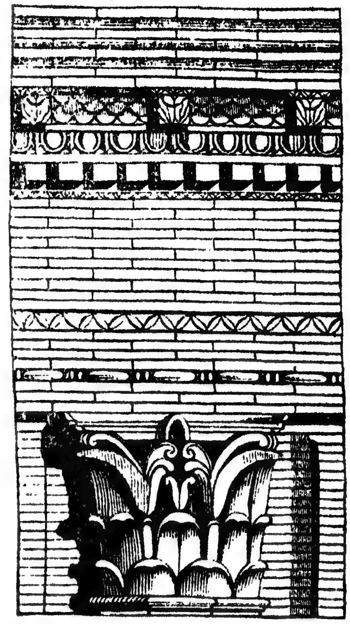


Fig. 4.—Elevation.



From these ancient examples of ornamental brickwork, may we trace the application of it to the various moulded fronts of houses, &c., subsequently erected in this and other countries. With regard to the method of manufacture, we learn from Vitruvius, that a red or chalky white earth, of a strong sandy nature, mixed with straw, was considered the best, on account of its not being heavy, which it was thought better to dig in the autumn, and make it into brick early in the spring; after they were moulded, they were placed in the shade to dry, and when made properly, they were not put into the kiln for two years afterwards. Alberti says, the ancients mixed marble with the red earth; and it was also customary for the Romans as well as the Egyptians to inscribe and impress their bricks with various devices. In the bigger sort, holes were left, that they might dry and burn better.

The height and thickness of the walls at Rome, anciently were, according to an old law, all built to a certain standard. Vitruvius says, no wall abutting on a public way was allowed to be more than one foot and a half thick; and Julius Cæsar, upon accounts of the mischief that might happen from bad foundations, ordered that no house should be more than one story high; and it is recorded that Augustus did account it a great commendation of himself, that having found Rome mostly built of brick, he left it of marble.

But when we view those vast remains of ancient splendour at the Palatine Mount, the aqueducts, baths, and temples, we must admit, that however much we may owe to the effect produced by the introduction of costly marbles, there was nothing wanted in the use of this material to produce the most powerful idea of strength and magnificence.

I have not sought for examples in those cities on the continent which owe their origin, or at least much of the rank they have since attained to the conquering hands of the Romans, but have transferred my inquiry to England,

"That pale, that white-faced shore,
Whose foot spurns back the ocean's roaring tides."

Fig. 5.

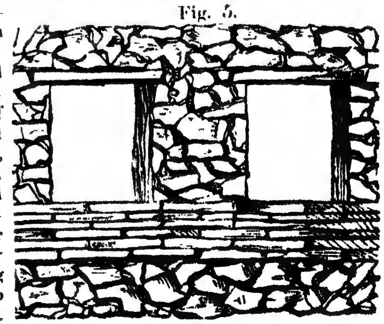


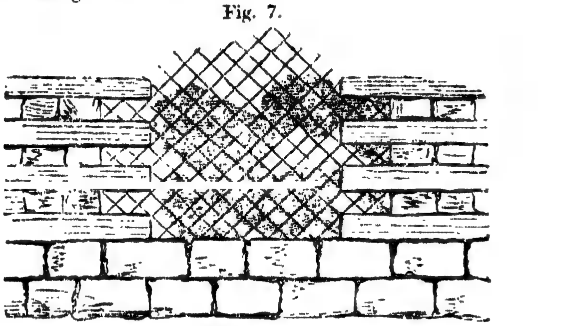
Fig. 6.

And here is attributed to the Romans their introduction, although the Britons might have been acquainted as well as the Gauls (and with whose country a correspondence subsisted) with the art of making bricks, both in the baked and unbaked form; but, however, it is only in the ancient Roman walls that we have the first record and example of their use in England, where they even then were very sparingly applied, being only inserted for the purpose of turning arches or in making bands to strengthen their other materials. These bands consisted of three or four courses of tiles laid through the wall, and were placed at two or three feet from each other, the intermediate space being built with cement, pebbles, and rag-stone, as fig. 5 and 6: in this manner, the walls of Verulam, Colchester, Chesterford, London, and other places, were built; and Stowe, in his account of the repair of part of London wall, gives the size of these bricks as measuring $17\frac{1}{2}$ inches long, $11\frac{3}{4}$ inches wide, and one inch and a quarter thick.

The Saxons and Normans, we find, continued to use bricks, and called their brickwork tigel; but it is rather uncertain whether they actually manufactured them, or collected them from the works erected by the Romans, for in most cases where they were used, their buildings were near some Roman station. The two churches at St. Alban's were built with the same sort of bricks; the one, St. Michael, built by the Saxons in the tenth century, and the Abbey Church, built by the Normans in the eleventh; but as it is found in the Abbey Church, some are moulded to form nowels, small round pillars, &c., &c. It is most probable, that the Saxons and Normans not only continued the practice of making them, but also deserve much credit for their ingenuity, in moulding them to other forms, as the intersecting arches to the west front of St. Botolph's Priory, in Colchester. How long the practice of making them the size of the Roman ones does not appear, but a change in the form began between the time of Henry the First and Edward the Second (1100 to 1307), when the Flemish manner of making them was introduced. However, the name of bricks was not universally adopted until the time of Henry the Sixth (1422). Wall tiles or bricks were used in some of the buildings belonging to the Priory of Ely, in the time of Edward the Second (1310), made in the Flemish manner, but of different sizes, being 12 inches long, 6 inches wide, and 3 inches thick; and others 10 inches long, 5 inches wide, and 2 inches thick. The price per thousand, in Edward the Third's time (1327), was from 6*s.* to 6*s.* 1*d.*, and they continued much at that sum, until the time of Richard the Second (1377), when they were sold at 6*s.* 8*d.*; at this period, Michael de la Pole, a rich merchant of Hull, erected a large house entirely of brick; and this, one of the earliest thus constructed, set the example for building in that style.

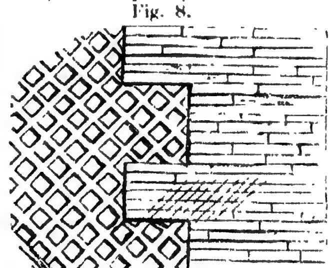
The peculiar method of building with them at this time was merely by facing the wall with brick, irregularly laid, in many instances, and in others in chequered patterns, with black flints, the foundations being formed with rag-stones. See fig. 7.

Fig. 7.



When a more perfect manner of constructing buildings, and its more general use divested it of much of its original irregularity, and towards the latter end of the reign of Henry the Seventh (1505), and beginning of that of Henry the Eighth, the mansions began to lose their castellated character, though still retaining many of its peculiarities. Layer Marney Hall, Essex, built in the time of Henry the Eighth, is a very good example. Chequered compartments of flints, diagonal lines of dark flagged bricks, were frequently introduced into the front of buildings about this period; and in 1530, Hans Holbein, the painter, built a gate at Whitehall, opposite the Banqueting-house, in this manner, with chequered brickwork, stone, and black flints, and ornamented the front with busts, in recesses. Buildings of a deep red brick, window reveals moulded in brick, and during the reigns of Mary and Elizabeth (1553—1558), the ornaments of Roman Architecture, were frequently introduced in brick, or baked clay, which laced the fronts of houses, and covered the shafts of chimneys, and continued in numerous fantastical shapes, until the reign of James the First (1603). Shortly after, they were laid aside. In this and the preceding reign, the walling was very bad, being mere rubbish, or even turf or peat, between two thin shells of brick. Inigo Jones introduced a better method, of which the piers in Lincoln's Inn-Fields are an excellent specimen; and Sir Richard Crispe, the patriotic friend of Charles the First, is said to have been the inventor of the art of making them as now practised. "In the year 1587," says Fuller, "began beautiful buildings in England, as to the generality thereof—whose homes were but homely before, are now most regular pieces of architecture."

Fig. 8.



The method adopted principally in these ages of building with brick was in what we term now English Bond, which was certainly well understood, and many durable examples of which still continue to adorn this country; but about the time of James, and for a long period after, a very careless method of erecting walls with brick began and continued; and although much is attributed to its perfection in the days of Inigo Jones, it does not appear, upon examination of several old buildings, that it was thoroughly understood and appreciated until some years after, when its peculiar advantages over wood, a very common method of building, began to present itself to the government of James the First; and accordingly we find a proclamation by him, March 1st, 1605, forbidding all increase of *all* new buildings within the city and one mile thereof, and likewise commanding all persons henceforth to build with either brick or stone; and another, Oct. 10, 1607, to the same purpose, when it appears that some were censured in the Star Chamber for building contrary to the tenor of the proclamation; and again, in 1614, all commissioners were required to proceed with strictness against offenders in this sort, "for from this time," says Stowe, "began the new reformation in building." But it was not until after the Great Fire of London that it attained universal adoption; and to the age of Sir Christopher Wren, and his immediate successors, must we feel indebted for some of the finest specimens, as far as regards neatness of workmanship, of which the entrance to the Middle Temple, and several fronts of houses about the city and west end of the town, are excellent examples, when the method, styled Flemish Bond, was introduced.

Its use, since then, has been unremittingly multiplied, together with the buildings in this vast city; for, according to Stowe, we find there were, in 1682, only 84,000 houses in the walls of the city, the borough of Southwark, and city and liberties of Westminster; and in 1831 we find the number more than doubled, being no less than 185,000. In 1834, duties were paid upon 1180 millions of bricks; and I find, in 1835, the amount of duty paid on bricks amounted to no less a sum than 395,030*l.* 7*s.* 8¾*d.*

I shall not take up your time further with descriptions of the various purposes to which it is at the present day applied, although I think much benefit and amusement might be afforded in so doing, but hope some more able member will take up the subject and supply the deficiencies, of which, I doubt not, there are many occurrences here.

In concluding, I beg to return many thanks for the kind attention the Society have favoured me with in this my attempt to illustrate the antiquity and application of so useful a material, which to this period composes alike the walls of the monarch's palace and the peasant's dwelling.

MEETINGS OF SCIENTIFIC SOCIETIES.

Institution of Civil Engineers, 1, Cannon-row, Westminster, every Tuesday Evening, at 8 o'clock.

Royal Institute of British Architects, 16, Grosvenor-street, Grosvenor-square, Monday Evening, 8 o'clock, January 15th and 29th.

Architectural Society, 35, Lincoln's Inn-fields, Tuesday, January 2nd, 16th, and 30th.

Society of Arts, Adelphi, every Wednesday, 8 o'clock; Illustration, Tuesday, January 9th.

PARLIAMENTARY PROCEEDINGS.

House of Commons.—For the Session 1837-8.

Nov. 21.—Private Bills.—Standing Order [18th June, 1811] read:—Resolved, "That this House will not receive any Petition for Private Bills after Friday, the 16th day of February next." Resolved, "That no Private Bill be read the first time after Monday, the 26th day of March next." Resolved, "That this House will not receive any Report of such Private Bill after Monday, the 11th day of June next."

Nov. 22. Petitions for Private Bills.—Select Committee appointed, "to whom all Petitions for Private Bills are to be referred, except those for making any Turnpike Road, or to continue or amend any Act for making, maintaining, keeping in repair, or improving any Turnpike Road." Mr. Aglionby, Mr. Baines, Mr. Bingham Baring, Mr. Bell, Mr. Bowes, Mr. Bramston, Sir John Yarde Buller, Mr. George Cavendish, Mr. Chalmers, Lord Viscount Clements, Mr. Robert Clive, Mr. Compton, Mr. Gibson Craig, Mr. Crawford, Mr. Dunlop, Lord Viscount Eastnor, Mr. Tatton Egerton, Captain Gordon, Mr. Greene, Mr. Halford, Major Handley, Mr. Hodges, Mr. Henry Thomas Hope, Captain Jones, Mr. Hope Johnstone, Mr. Shaw Lefevre, Mr. Mildmay, Mr. Morgan John O'Connell, the O'Connor Don, Mr. Robert Palmer, Mr. Pease, Mr. George Philips, Mr. Poulter, Mr. Sanford, Mr. Stansfield, Mr. Villiers Stuart, Mr. Strutt, Sir Charles Style, Sir Harry Verney, Mr. Wodehouse, Lord Worsley, Mr. Wrightson.

Standing Orders.—Select Committee appointed, "to whom shall be referred all Reports from Committees on Petitions for Private Bills, in which it shall be stated that any of the Standing Orders of this House have not been complied with, and to report their opinion thereupon from time to time to the House."—Lord Viscount Clive, Lord Viscount Ebrington, Mr. Estcourt, Sir Thomas Fremantle, Mr. Montagu Chapman, Sir Edward Knatchbull, Mr. Wilson Patten, Mr. Pendarves, Sir Robert Price, Lord Viscount Sandon, Sir George Strickland, Sir Matthew Wood, Mr. George Wilbraham, Mr. William Miles, Mr. Pringle. Power to send for persons, papers, and records, five to be the quorum.

Nov. 21.—Margate Improvement. Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Nov. 27.—Railroads.—Select Committee appointed, "to consider the present state of the communications by Railroads, so far as it affects the regularity and convenience of the transmission of Letters, and the Post Office in general; to ascertain on what terms Mails are now conveyed by the Railroads in operation, and what measures it may be just and expedient to adopt for the purpose of securing to the public, in future, the benefit of the conveyance of the Mails by Railroads."—Mr. Baring, Mr. Wallace, Mr. Labouchere, Lord Viscount Lowther, Mr. Gillon, Lord Viscount Sandon, Mr. Hutton, Mr. Scholefield, Mr. Greene, Lord Seymour, Mr. Easthope, Lord Granville Somerset, Lord Charles Fitzroy, Sir Robert Fergusson, Mr. Loch. Power to send for persons, papers, and records, five to be the quorum.

Nov. 28.—Railroads. Petition of Thomas Parkin, praying for an Act appointing a Board of competent persons to inspect all Railroads previous to their being used, who shall certify the same as safe and fit for use; to lie on the table.

Nov. 29.—Patents for Inventions.—Bill to amend the Law of Patents, and to secure to individuals the benefit of their inventions, ordered to be brought in by Mr. Mackinnon and Mr. Baines.

Nov. 30.—Railway Colonnades.—Petition of Robert Thomas Webb, suggesting a Plan for erecting Railway Colonnades over the Foot-pavements of London, and praying the appointment of a Committee to inquire into its merits; to lie on the table.

Dec. 4.—Newcastle-upon-Tyne and Carlisle Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 4.—Thames Improvement Company and Drainage Manure Association.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 4.—Houses of Parliament.—Bill to enable the Commissioners of Her Majesty's Woods and Forests, Land Revenues, Works, and Buildings, to purchase ground and tenements required to complete the site for the New Houses of Parliament, ordered to be brought in by Mr. E. J. Stanley and Mr. Baring

Dec. 4.—Government Architects.—Address for "Return of the names and dates of the appointments of the several Architects now employed by the Commissioners of Woods and Forests, or by any other department of the Government, to prepare plans, and to superintend the erection or repairs of public buildings; stating the amount of salary, if any, which each receives for that duty, and the rate per cent. allowed on the expenditure as commission for said duties; stating also the regulations under which the public works are conducted by the Government Architects in England."

"Also, a Return of the amounts paid to each Government Architect for salary, for plans, and for superintending the works, and what works, stating the rate per cent. allowed, and the amount of the gross expenditure for each work, in each year since 1820, in England."

"Similar Returns for Scotland and for Ireland."

Dec. 5.—Milton-next-Sittingborne Improvement. Petition for Bill reported, and Bill ordered to be brought in by Sir Edward Knatchbull and Mr. Plumptre.

Dec. 7.—Anti-Dry Rot Company.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 7.—Houses of Parliament Bill.—Read 2d; and committed for this day

Dec. 8.—Houses of Parliament Bill. Petition of Owners and Occupiers of Houses in Abingdon-street, Westminster, for alteration; to lie on the table

Dec. 8.—Houses of Parliament Bill.—Order for Committee read, and discharged.—Bill committed to Mr. Edward John Stanley, Lord Viscount Lowther, Colonel Evans, Mr. Byng, Mr. Charles Wood, Mr. Leader, Lord Granville Somerset, Sir Matthew Wood, Mr. Gally Knight, Mr. Moore O'Ferral, Mr. Thomas Wood, Captain Ellice, Mr. Hume; five to be the quorum. Petition from Abingdon street presented this day; referred.

Dec. 8.—Houses of Parliament.—Copy or Abstract ordered, "of the Tenders delivered by Builders for the Embankment and the Terrace, and a portion of the Foundation of the Buildings of the Houses of Parliament; and stating which of them have been accepted.—Also, an Abstract of the estimates made by Messrs. Walker and Burge, engineers, and Mr. Barry, the architect for the same works, as approved of, and confirmed by, the Surveyors of the Office of Woods and Works, and contained in the Report made by the Commissioners of the Woods and Works, and laid on the table of the House of Commons."

Dec. 11.—London and Greenwich Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 13.—Patterns and Inventions.—Bill to encourage the advancement of the Arts by securing to individuals the benefits of their Patterns and Inventions for one year, ordered to be brought in by Mr. Mackinnon and Mr. Baines

Dec. 14.—Margate Improvement.—Petition for Bill reported, and Bill ordered to be brought in by Sir Edward Knatchbull and Mr. Plumptre.

Dec. 14.—Necropolis Cemetery.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 15.—Thames Improvement Company and Drainage Manure Association.—Petition for Bill reported, and Bill ordered to brought in by the Earl of Euston and Mr. Wilberforce.

Dec. 15.—Houses of Parliament Bill. Reported, and recommitted for to morrow.

Dec. 16.—Houses of Parliament Bill. Considered in Committee, and reported, with an Amendment; Amendment agreed to; Bill to be read 3rd time on Monday next.

Dec. 18.—Milton next Sittingborne Improvement Bill, "for better paving, cleansing, lighting, watching, and otherwise improving the town of Milton-next-Sittingborne, in the county of Kent;" presented, and read 1st time; to be read 2nd time.

Dec. 18.—Houses of Parliament Bill. read 3rd time, and passed

Dec. 19.—Houses of Parliament.—Abstract presented of Tenders for Embankment, &c. of the New Houses of Parliament [ordered 8th of December]; to lie on the table.

Dec. 21.—Saltash Floating Bridge.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 21.—Union Workhouses.—List ordered, "of the Unions for which Work houses have been ordered by the Poor Law Commissioners to be built, purchased altered, or enlarged, from the passing of the Poor Law Amendment Act to the present time, with the number of persons to be provided for, the amount authorized to be expended, and the names of the Architects and Contractors."

Dec. 21.—Metropolis Improvements.—Select Committee appointed, "to consider and report to the House the best means of carrying into effect the Improvements in the Metropolis, as reported by the Select Committee in the Session of 1836." Sir Matthew Wood, Mr. Chancellor of the Exchequer, Sir Robert Peel, Lord Viscount Lowther, Mr. Herries, Admiral Codrington, Sir Robert Harry Inglis, Mr. Shaw Lefevre, Mr. Wakley, Colonel Evans, Mr. Clay, Mr. George Palmer, Mr Pendarves, Mr Barnard, Mr. Hall. Power to send for persons, papers, and records; five to be the quorum:—Report from Committee [2d August, 1836] referred to the Committee.

Dec 21.—Public Monuments.—Return ordered, "of the number of Monuments erected in Westminster Abbey and St. Paul's at the public expense, from the year 1750 to the present time; specifying the names of the persons to whose honour they were erected, and the sums paid for each; with the aggregate amount."

Dec. 21.—Houses of Parliament.—Abstract of Tenders for Embankment, &c. [presented 19th December] to be printed.

Dec. 22.—Paington Harbour Bill.—"for making and maintaining a Harbour and other Works at Paington, in the county of Devon;" presented, and read first time; to be read second time.

Dec. 22.—London and Croydon Railway (No. 1)—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Dec. 22.—London and Croydon Railway (No. 2)—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

House of Lords.—The following are the resolutions adopted by the House of Lords regarding Private Bills: "Ordered, that the House will not receive any petition for a private bill after Tuesday, the 20th day of March next. Ordered, that the House will not receive any report from the judges, upon petitions presented to the House for private bills, after Monday, the 30th day of April next. Ordered, that the said orders be printed and published, and affixed on the doors of the House and Westminster Hall."

LIST OF PATENTS GRANTED BETWEEN THE 2nd AND 23rd DECEMBER, 1837, BOTH INCLUSIVE.

James Dowie, of Frederick Street, Edinburgh, Boot and Shoe Maker, for his invention of "Certain Improvements in the Construction of Boots and Shoes or other coverings for the Human foot."—2nd December; 6 months.

William Occleshaw, of Manchester, in the county of Lancaster, Leaden Pipe Manufacturer, for his invention of "Certain Improvements in the Machinery or Apparatus for Manufacturing Pipes or Tubes, or other similar articles from Lead or other Metallic Substances."—2nd December; 6 months.

Thomas William Booker, of Merlin Griffith Works, Glamorganshire, Iron Master and Tin plate Manufacturer, for his invention of "Improvements in preparing Iron to be coated with Tin or other Metals."—4th December; 6 months.

George Cottam, of Winsley Street, Oxford Street, in the county of Middlesex, Engineer, for his invention of "Improvements in the Construction of Wheels for Railway and other Carriages."—5th December; 6 months.

Moses Poole, of the Patent Office, Lincoln's Inn, in the county of Middlesex, Gentleman, for "Improvements in Looms for weaving Figured and Ornamented Fabrics, being a communication from a foreigner residing abroad."—5th December; 6 months.

Moses Poole, of the Patent Office, Lincoln's Inn, in the county of Middlesex, Gentleman, for "Improvements in Printing, being a communication from a foreigner residing abroad." 5th December; 6 months.

John Hall, of the town of Nottingham, in the county of Nothingham, Lace Manufacturer, for his invention of "Certain Improvements in Machinery, whereby Cloth or woven Fabrics of various kinds may be extended, or stretched, and dried in an extended state." 5th December; 6 months.

Joshua Taylor Beale, of Church Lane, Whitechapel, in the county of Middlesex, Engineer, for his invention of "Certain Improvements in, and additions to his former invention, known by the title of a Lamp, applicable to the burning of substances not hitherto usually burned in such vessels or apparatus, and secured to him by Letters Patent, dated 4th February, 1834."—7th December.

Samuel Mills, of Darleston Green, Iron and Steel Works, near Wednesbury, in the county of Stafford, Iron Master, for his invention of "Improvements in Machinery for Rolling Metals." 9th December; 6 months.

Jeremiah Bynner, of Birmingham, in the county of Warwick, Lamp Manufacturer, for his invention of "Improvements on Lamps." —9th December; 6 months.

Benjamin Cook, of Birmingham, in the county of Warwick, Brass Founder, for his invention of "An Improvement in Gas Burners, commonly called or known by the name of Argand Burners."—9th December; 6 months.

Cornelius Ward, of Great Titchfield Street, Mary-le-bone, in the county of Middlesex, Musical Instrument Maker, for his invention of "Improvements on the Musical Instruments designated Drums."—9th December; 6 months.

Thomas Vale, of Allen Street, Lambeth, in the county of Surrey, Coach Joiner, for his invention of "Improvements in Hinges."—13th December; 6 months.

James Hunter, of Leys Mill, Arbroath, in the county of Forfar, Mechanic, for his invention of "A Machine for Boring or Perforating Stones." 13th December; 6 months.

William Elliott, of Birmingham, in the county of Warwick, Button Manufacturer, for his invention of "Improvements in the manufacture of covered Buttons." —14th December; 6 months.

Thomas Joyce, of Camberwell New Road, in the county of Surrey, Gardener, for his invention of "Improved Apparatus for Heating Churches, Warehouses, Shops, Factories, Hot houses, Carriages, and other Places requiring Artificial Heat, and improved Fuel to be used therewith."—16th December; 6 months.

Joshua John Lloyd Margary, of Wellington Road, St. John's Wood, in the county of Middlesex, Esq., for his invention of "A New Mode of Preserving Animal and Vegetable Substances from Decay."—19th December; 6 months.

John Gray, of Liverpool, in the county of Lancaster, Engineer, for his invention of "Certain Improvements in Steam-Engines and Apparatus connected therewith, which Improvements are particularly applicable to Marine Engines for Propelling Boats or Vessels, and part or parts of which Improvements are also applicable to Locomotive and Stationary Steam Engines and other Purposes."—19th December; 6 months.

Edmund Butler Rowley, of Charlton upon Medlake, in the parish of Manchester and county of Lancaster, Surgeon, for his invention of "Certain Improvements applicable to Locomotive Engines, Tenders, and Carriages, to be used upon Railways, and which Improvements are also applicable to other Useful Purposes."—19th December, 6 months

John White, of Manchester, in the county of Lancaster, Engineer, for his invention of "Certain Improvements in Apparatus usually employed in Lathes for Turning Metals and other Substances."—19th December; 6 months.

James Berington, of Winchworth Place, St. Leonard's, Shoreditch, Gentleman, and Nicholas Richards, of Camomile Street, in the city of London, Builder, for their invention of "Certain Improvements in Curing or Preventing Smoky Chimneys, which Improvements are also applicable to the purposes of Ventilation."—19th December; 6 months.

Christopher Nickels, of Guildford Street, Lambeth, in the county of Surrey, Gentleman, and Henry George Collins, of Queen Street, Cheapside, in the city of London, Bookbinder, for his invention of "Improvements in Bookbinding, parts of which Improvements are applicable to the Cutting Paper for other purposes."—19th December; 6 months.

John Robertson, Jun., formerly of Tweedmouth, Berwick, but now of Great Charlotte Street, Buckingham Gate, in the county of Middlesex, Gentleman, for his invention of "Improvements of Architecture, as regards its Construction, or in the Description or Properties of the Forms and Combinations, and also of the Superficial Figures which may be employed; the Application of these Improvements, or of the Principles or Method thereof, being also for supplying Forms, Figures, or Patterns, in various Arts or Manufactures; also for an Improvement or Improvements with regard to the Surfaces of Buildings, whether Interior or Exterior, for Protecting them from Decay, and also giving them a more Finished Appearance."—19th December; 6 months.

William Henry Pitcher, of the West India Dock House, Billiter Square, in the county of Middlesex, Merchant, for his invention of "Improvements in the Construction of Docks, and Apparatus for repairing Ships and Vessels."—19th December; 6 months,

N[illegible] Clay, of West Bromwich, in the county of St[illegible], M[illegible] Chemist,

for his invention of "Improvement in the Manufacture of Iron."—19th December; 6 months.

William Sandford Hall, of Streathearn Cottage. Chelsea, Lieutenant in the Army, for his invention of "Improvements in Paddle Wheels."—19th December; 3 months.

the means of communicating intelligence by signals."—22nd December; 6 months.

Charles Button, of Holborn Bars, Chemist, and Harrison Grey Dyar, of Mortimer Street, Cavendish Square, Gentleman, both in the county of Middlesex, for their invention of "Improvements in the Manufacture of White Lead."—23rd December; 6 months.

William Bundley, of Birmingham, in the county of Warwick, Patent Paper Tray Manufacturer, for his invention of "Improvements in the Construction of Presses."—23rd December; 6 months.

William Losh, of Benton Hall, in the County of Northumberland, Esquire, for his invention of "Improvements in decomposing Muriate of Soda, (Common Salt), parts of which Improvements are also applicable to the condensing Vapours of other processes."—23rd December; 6 months.

Jehiel Frankling Norton, of Manchester, Merchant, for "Certain Improvements on Stoves or Furnaces; being a communication from a foreigner residing abroad;" 23rd December; 6 months.

John Elvey, of the city of Canterbury, in the county of Kent, Millwright, for his invention of "Improvements in Paddle-Wheels," 23rd December; 6 months.

STEAM NAVIGATION.

Havre.—On the 24th November last was embarked from this port for Hamburgh, all the machinery for the engines of two steam boats, built in Belgium, to commence the operations of the Company established for navigating the river Meuse. A house of this place (Messrs. Durosselli and Co.) has been placed at the head of this company: present appearances of success are most favourable, as there are, in the course of the river Meuse, a great number of populous towns. The two boats will commence service next spring; they will be propelled by steam engines of thirty horse power, are calculated to carry at the least 150 passengers, and will not draw more than 20 inches of water. The engines, including water in the boiler, will not weigh more than 18,000 kilogrammes (39,677 lbs. English). The engines were manufactured by Mr. John Cockerill of Seraing, who also furnished those for the Tagus steam-boat. This is the first time that machinery for steam-boats have been constructed in our port for foreigners: it is expected that this new branch of industry will be attended with the best success, and that it will preserve to the port of Havre that superiority for which it has been hitherto distinguished.

A new steam ship, named the *Tagus*, was launched on the 30th of November last, in this port. She is the largest and best that has been constructed in France: the tonnage of this superb boat is 600 tons, she is to navigate between Havre, Vigo, Oporto, Lisbon, and Cadiz: it is calculated that she will (although touching at Vigo and Oporto) perform her voyage to Lisbon in 90 hours, and to Cadiz in 120 hours. She is to carry 150 tons of coal, and 200 tons of merchandise, besides accommodation for 100 passengers. Her engines were manufactured by Mr George Cockerell, and are equal to 172-horse power; they are constructed on a new system, and will not consume more than 800 kilogrammes (1,763 pounds English) of coal per hour, without merchandise, she can take sufficient fuel to last fifteen days. A new plan has been adopted in fitting up this ship, conformably to the wants of the country which she is destined to visit; instead of a single chamber, surrounded with cabins, there will be a dining room and a spacious saloon, where the passengers can repose during the heat of the day. She is the second steam-ship which has been launched in the port of Havre within the last few days. the two are reckoned to be the finest steam boats in France.

Steam Navigation for Long Voyages.—A proposal has been made for shortening the communication with New South Wales, by steam communication with Acapulco to Vera Cruz, touching at Otaheite for coals, by means of which the voyage might be accomplished within fifty days. A plan by which the whole course might be completed in from sixty five to seventy days is by way of the proposed steamers to Jamaica, and thence, through Panama, to Lima and Chili, from the latter of which an extensive intercourse is carried on with Australia in wheat.—*Courier.*

Steam v. Draught Power.—Two new vessels have been launched, the *Wilberforce* and *Seahorse*, for the Hull and London stations, which are to perform the distance in 18 hours, for 5*s*. Coaching between Hull and London is 1*l*. 10*s*. outside, and for the last month, it has taken, upon an average, 23 hours to do the journey. In the one case the passengers are exposed to the atmosphere day and night, in the other they are snugly ensconced in a warm and convenient room. The coach fare from Lincoln to London is now 1*l*. 8*s*. outside by the night coach, and the journey takes 18 hours. *Lincoln Gazette.*

Advancement of Science in Steam Navigation.—It is with pleasure we lay before our readers an account of the trials of the *William Wilberforce* steamer, which took place before she proceeded to Hull, to the great satisfaction of a number of scientific gentlemen who witnessed the performance of the engines. Nothing could surpass the beautiful style in which the vessel passed down the Thames, the engines performing in a manner beyond the expectation of every one on board. The *Wilberforce* is commanded by Captain Wilkinson, and belongs to the spirited and enterprising gentlemen forming the Humber Union Steam Company, and is for the conveyance of passengers, &c., between Hull and London. That which gives to the engines of this vessel a great superiority, and an immense additional power, is the application of Mr. Samuel Hall's, of Basford, patent condensers, which are becoming generally applied to first rate steam-vessels, and which no doubt, ere long, will be found in every steam-packet of importance. On both of the above occasions, the barometer indicated a vacuum in one engine of 29⅝ inches of mercury, and in the other of 29⅝ inches, the engines making 21 strokes of six feet per minute. The advantages attending Mr. Hall's patent condensing engines in heavy gales and storms at sea are quite surprising, for it matters not how hard it blows or how heavy the sea rolls, the same uniform power is maintained as in a calm; and while common engines, under similar circumstances, cannot keep up the vacuum to a higher point than from 20 to 25 inches, the patent engines obtain a steady vacuum of from 29 to 29¾ inches. The cause of this superiority is very obvious. In the common condensing engine, the steam is condensed by a jet of cold water coming in contact and mixing with it, the whole having to be removed by means of the air-pump—the quantity varying from five to seven gallons per horse-power per minute. Now, it is well known to practical engineers, that if so much water were injected as to keep the common engine up to its full power in a rough sea, it is highly probable that the engine would break down, and that the vessel would be greatly endangered; because, in a rough sea,

brought up almost to a stand; and as the injection is pouring in as rapidly when the engines are going at a slow as at a quick speed, the engines will be brought up altogether, or a breakage takes place, unless the injection water be reduced much below the average quantity required to keep a sufficient vacuum. No such danger or difficulty can take place with Mr. Hall's patent engines; for he condenses through the medium of metallic surfaces, whereby the condensing water from the sea never comes in contact with or mixes with the steam. The quantity of sea water required to be injected in a pair of common marine engines equal to those of the *Wilberforce* (viz., 300 horse power) is about 1,800 gallons per minute, which has to be pumped out of a vacuum by the air pump, whereas Mr. Hall's engines aboard the *Wilberforce* have only twenty gallons per minute requiring pumping out of a vacuum by such pump. There are many other important advantages resulting from Mr. Hall's patent invention, such as the much greater durability of the boilers, owing to their being supplied with pure distilled instead of sea or dirty water, in consequence of which the saline and earthy deposits, which must inevitably take place in common engines, are avoided. A great saving of fuel is the result of thus working with clean boilers, which never require blowing out, and the consequence is, additional room for the stowage of goods in proportion to the reduced quantity of fuel required. A great many more advantages are consequently obtained, but we will confine ourselves to adding those of the avoiding of the well-known nuisance of muddy water from the boilers being frequently showered over the passengers, and of the utter impossibility of an explosion taking place from want of water in the boilers.—*Correspondent of the Hull Observer.*

PROGRESS OF RAILWAYS.

Arbroath and Forfar.—Three parts of this railway are already finished. It is expected that in May next it will be partially at work, and that in August, at the latest, it will be in full operation.

Edinburgh, Leith, and Newhaven Railway.—We are authorized to state, that this undertaking is progressing rapidly, above 400 yards of the deepest cutting have been completed, and upwards of 50,000 cubic yards of earth excavated.

Edinburgh and Dalkeith Railway.—(Main line 10¼ miles long; branches 6½ miles.) The original object of this railway was to open a better and cheaper communication than previously existed between collieries and limestone quarries in the district through which it passes, and the Scottish capital, as well as the port of Leith; but so much has it been resorted to by passengers, that since the opening of it up to the 11th instant inclusive, there have been no less than 1,406,932 persons conveyed by it; and of this vast number *three only* met with serious injuries, from which, however, they ultimately recovered.

Eastern Counties. The works of this railway are now pushed as far as Ilford, and it is confidently expected that it will be opened to that town (seven miles) next summer. The Lea Bridge, Stratford Viaduct, Mill Pond and Abbey River Bridges, of five arches, are all completed, with the exception of the parapets, which will not be added till time have been allowed for the usual settlement of the masonry and brick-work. The Stents Mill, Angel Lane, and Maryland Point Bridges, are also fast advancing to completion; and last week, preparations were commenced for the erection of the only two other bridges of consequence on this side of Ilford, namely, those over the Aldersbrook and the Roding. *Railway Times.*

Great Northern Railway.—The Directors of this noble undertaking have already contracted, on very advantageous terms, for the execution of that part of the line extending from the much celebrated Stockton and Darlington Railway to Birkby, a distance of about eight miles; and that they have, in like manner, concluded a contract for the erection of a bridge over the river Tees, at Croft, a work of considerable magnitude: thus giving earnest to the shareholders of their determination to proceed with vigour, in order to a speedy completion of this connected link, so much needed to unite the North of England and Scotland with the southern counties, by means of the York and North Midland, North Midland, Midland Counties, &c. &c. railways, all expected to be in simultaneous operation at no remote period, so as to communicate with the Grand Junction, and London, and Birmingham railways. From all the data in our possession relative to this great national railway, we cannot help congratulating such of our readers as happen to possess an interest therein on the certain prospect now before them of ultimately deriving most ample remuneration on their capital so invested, more especially when we find that the Grand Junction Railway, which cost so much more than the Great North of England will do, is likely to pay to the fortunate shareholders a dividend at the rate of *twelve* per cent. per annum for the first six months. What this admirably managed undertaking will realize to the shareholders, when the London and Birmingham line and its other tributaries shall come into full operation, it is impossible to calculate with any degree of precision.—*Liverpool Journal.*

Grand Junction Railway.—It is said that the Post office Department have concluded a valid agreement with the Directors, which will enable the inhabitants of Liverpool, after the first of May next, to receive their London letters, dispatched on the preceding evening, at eight o'clock on the following morning.—*Standard.*

Grand Junction Railway.—Notice has been given, that it is intended to dispatch a train from the station in Lime-street, on Tuesday next, for the conveyance of pigs to Birmingham, which will be continued every Tuesday, Wednesday, and Thursday. This accommodation will open a new field of traffic to the dealers in Irish pigs, the increase and improvement in this stock having been very great of late. Hitherto the arrivals from Ireland have been principally taken to Manchester and some parts of Yorkshire.—*Liverpool Times.*

Lancaster and Preston.—The whole of the line of Railway has been re-measured and some slight variations and improvements have been determined on.—*Lancaster Guardian.*

North of England.—The contract for the formation of about eight miles of this Railway south of Darlington, was let on the 31st ult., the works of which will be commenced forthwith.—*Hull Advertiser.*

Sheffield, Ashton-under-Lyne, and Manchester Railway.—We are authorized to state, that the above undertaking is in a progressive and daily improving state, and that operations will be commenced early in the spring. The statement which has appeared in several of the papers, relative to its abandonment, is totally without foundation.—*Manchester Guardian.*

Whitby and Pickering Railway.—A great increase has taken place in the tonnage amount of traffic and number of passengers conveyed on this line during the last half year, the increase in the latter being 8,000, and the former 6,000 tons over the previous half-year.—*Hull Packet.*

London and Birmingham.—On the 1st of January next, the London and Birmingham Railway will be open as far as Stoney Stratford, and also the Birmingham end as far as Rugby, making in the whole 77 miles of this great undertaking completed.

Lancaster and Glasgow.—At the Penrith meeting on Tuesday week, the Earl of Lonsdale in the chair, Mr. Brockbank, in alluding to the western line over Morecambe Bay to Whitehaven, said, tha Mr. Stephenson had made a mistake of fourteen miles in computing the length of the line by the coast. He stated it would be eighty-eight miles, whereas in point of fact it would be one-hundred and two. The distance from Lancaster to Ulverstone was twenty-two miles, to Whitehaven, from the latter place, was forty-one, and Carlisle was thirty-nine from Whitehaven; and, upon a moderate computation, the error in the cost would amount to 200,000*l.* The expense of embanking twenty miles of sand would be enormous, far exceeding the cost of the formation of a tunnel, which would occur on the inner line. M. Brockbank further suggested, that a line might be adopted seven miles longer than that over Shap Fells, but thirty miles shorter than the coast line. There would be no tunnelling or cutting of consequence on this line. It appears that the line recommended by Mr. Brockbank will go within eight miles of Kendal, while the coast line would, at the nearest point, be sixteen miles distant.—*Lancaster Guardian.*

Bolton and Preston Railway.—This line of Railway seems to be at length determined upon, and is likely to be commenced in good earnest, and completed with success. The principal obstacle in its way is the high ground, a mile to the north of Chorley, under which, and the turnpike road, it will pass by a tunnel above a third of a mile in length, and at a depth of seventy-two feet from two of the summits on the surface. It had, however, been long ago ascertained that the material below consisted partially of loamy gravel, but for a considerable length under the highest part, of a bank of dry and solid marl, to a depth of one hundred feet. The borings which have been made on the south east side of the hill, corroborate former observations, and the writer of this article is confident that the north-western slope will be still more favorable. At all events, by keeping only fifty yards still more to the north, favourable results would be quite certain. This, however, would lead the projected line too far from entering the North Union Railway to advantage, with which it is intended to form a junction, a short distance from Rose Wittles. The above is only a cross line of communication betwixt the two rail roads, of about two miles and a half in length. That which is more direct to Preston, and perhaps to Blackburn, will afterwards, we understand be proceeded with.—*Preston Observer.*

London and Birmingham Railway.—The works of this great undertaking are proceeding most favourably—the worst points, viz., at Kilsby and Blisworth, being now quite under command. One hundred and fifty yards of the Kilsby tunnel were completed last month, and one hundred and seventy four the month preceding, leaving on the 5th instant only seven hundred and fifty six yards to accomplish. There is every reason to anticipate that the whole line will be open for traffic by the 1st of next October.—*Railway Times*

Uxbridge and Staines Junction.—The newly projected collateral line of railroad, called the "Grand Western Uxbridge and Staines Junction Railway" (plans of which have been forwarded to the different parishes, through which it is intended to pass, some months since), is intended to be introduced to the notice of Parliament as early in this session as possible. The bill, when obtained, is to be put into operation as quickly as possible.—*Aylesbury News*

FOREIGN RAILWAYS.

Austrian.—The railroad near Vienna called *Kaiser Ferdinand's Nordbahn*, or the Emperor Ferdinand's North way, was partially opened on the 23d of November, from Florisdorf to Wagram, a distance of one German mile and three quarters, or about eight English miles. An immense crowd, including all the fashionable world of Vienna, assembled to witness the novel and interesting spectacle. A train of eight passenger carriages was formed, some conveying eighteen, and others twenty-four, the whole train one hundred and fifty individuals, and attached to a locomotive machine of thirty-horse power. The locomotive, which was ordered from England, arrived at Vienna some months ago, and has since been a great object of curiosity to all the engineers and mechanicians of the capital, who express the most unbounded admiration of its construction. The passenger-carriages were, we believe, of native make, and are highly praised for their luxurious elegance. At ten o'clock precisely the whole train moved off, to the enthusiastic delight of the spectators, and safely arrived at Wagram in twenty six minutes, where it was turned round, and guided back to Florisdorf. The whole affair went off to the satisfaction of all parties. It is anticipated that early in December, the line will be practicable as far as the Prater itself, the gigantic bridge over the great branch of the Danube being now nearly completed.

Dutch.—A pamphlet by Mr. Donker Curtius, in favour of the extension of railways in Holland, has met with an opponent in the person of Mr A. F. Bouricius, "Royal Prussian Titular Postmaster at Arnheim." Mr Bouricius, in his pamphlet on the subject, even declares himself opposed to the railway already begun between Amsterdam and Haarlem, observing, that "in commerce Amsterdam is now no more a Liverpool, than Haarlem is a Manchester." He considers that injury will be done to the capital already embarked in canals, treckschuyts, &c., and no counterbalancing advantages obtained by a mere increase in the speed of internal communications, the probable profits of which, in Holland, he regards as totally inadequate to reimburse its promoters. We can only observe, that the circumstances of Holland, with regard to canals, are certainly so peculiar, as to render the new improvement of less convenience to them than to any other state; but it would be a most singular spectacle, if, while almost all Europe is eagerly pressing forward to reap the advantages of this great discovery, and the thinly-peopled States of America, one of its richest, most industrious, most commercial, and most thickly-peopled communities, were to remain inactive.

French.—Operations are carrying on with activity on the railroad from Montpellier to Cette. The road through the morasses of Vic and Frontignan is already marked out, and that through the piece of water called the "Pond of Ingrill," begun. The works are under the direction of an English engineer, Mr. Thomas Brunton. A railroad is projected from Montpellier to Nismes.

Italian.—The works are begun on the railroad from Naples to Castellamare. The shares of this undertaking are 1,000 Italian *lire* each, or about 40*l.* sterling, each *lira* being equal to a French franc, or nearly tenpence English. The whole capital comprises eleven thousand of these shares, or eleven million of *lire*, about 440,000*l.* There is a great difference of opinion at Naples as to whether the undertaking will ever pay; but, we believe, little difference of opinion any where else.

Prussian.—The Royal permission, or "concession," as it is technically called, for the formation of a railway from Magdeburgh to Leipzig, was received at Magdeburgh, on the 24th of November, together with the law of expropriation, or permission to take possession of private landed property for the purposes of the railway, on the payment of an adequate compensation awarded to the proprietors, in the same manner as in the use of high roads made by Government. This permission is clogged with conditions, one of which is, that after the expiration of thirty years, the Government is to be at liberty to take possession of the whole concern, paying a compensation to the then existing shareholders—a measure which, of course, is certain to be adopted in case the undertaking should prove successful. Another is, that at the expiration of ninety years, the railway becomes unconditionally the property of the State. The new railroad is to pass through Kothen and Halle to Leipzig, where, by the time it is completed, it will find that from Leipzig to Dresden in full operation.—*Railway Times.*

Heilbronn and Ulm (German) Railroad.—The idea is now abandoned of forming a grand railroad through Wurtemburgh from Heilbronn to Ulm. The difficulties presented by the nature of the ground are unusually great; it rises and sinks in alternate swells the whole length of the line, so as to offer facilities for nothing but an undulating railway. The Wurtemburgers are not, however, disposed to abandon the hope of participating in the advantages of the great discovery of recent times. A railway is now projected from Stuttgard to Carlsruhe, which is likely to be carried into execution. On this line, the difficulties, though not so great as in the other, are still by no means small, as along some extent of it there is the same wave-like conformation of country.

Railways in France.—A letter from Havre of the 9th says, "Our Chamber of Commerce met yesterday, to consider the question of iron railroads, to which so little attention has hitherto been paid. The members of the assembly appointed Mr. Reilly, President of the Chamber of Commerce, and Mr. Ferrere, to go to Paris, to take the necessary steps to obtain the line from Paris to Havre."—*Railway Times.*

Baltimore and Ohio Railroad.—The revenue of this railway has increased as follows:—

	Dollars.
Year ending 1st October, 1832	18,305,311
1833	19,167,835
1834	22,297,392
1835	26,336,862

Thus, in four years it had nearly doubled. The receipts during the month of August, 1836, exceeded those of August, 1835, by 142,260 dollars, and this, notwithstanding a great reduction of the tolls on the Chesapeake and Ohio Canal.

Railway Travelling.—Marshal Gerard was lately making a tour through Belgium, and while at Antwerp, walked to the gate of the citadel, expressing a wish to see it once more. He was told, that without an express permission from the government he could not be admitted. "But I am Marshal Gerard," said he, "I helped to take the citadel, and I think I might be allowed to enter it!" "If you were the king himself," replied the officer on duty, "you should not enter without the permission of the minister of war." An *employé*, hearing this conversation, went up to the Marshal and said, "If you will walk about the town for a couple of hours, I will undertake to procure a permission in the interim." The Marshal accepted the offer. The *employé* immediately started for Brussels by the railroad, and returned in less than two hours, with an order, not only to admit the Marshal, but to place five hundred men under arms to render him military honours. The distance from Antwerp to Brussels is upwards of 28 miles.—*Greenock Advertiser.*

TRANS-ATLANTIC RAILWAYS.

We find from the various recent arrivals from the West Indies and North and South America, that a spirit of enterprise in Railway speculations is very fast spreading over the New World.

Mexico.—It appears by the papers from Vera Cruz, that a contract has been entered into by General Bustamente, the President of the republic, with a gentleman named Senior Agostina, for the construction of a line of Railroad from the city of Mexico to the port of Vera Cruz. The distance is about 176 miles, and the country tolerably favourable, with the exception of one very abrupt rise of several thousand feet, which occurs at the commencement of the table-land, at a distance of about 15 miles from Vera Cruz. This once surmounted, it does not appear that any further important obstacle occurs upon the line; for the table-land of Mexico is one vast and fertile plain, and timber and other materials universally abound. The papers contain the most sanguine anticipations of the advantages to Mexico, which this work will produce; for though Mexico is one of the finest and most fertile countries in the world, yet agriculture and trade are in their infancy, and neither coffee, cotton, nor sugar are exported, because of the impossibility of conveying those articles to the coast, so destitute is the country of any thing deserving of the name of roads. How the rise at the commencement of the table-land is to be surmounted we do not as yet understand, but presume that a break in the line must be the consequence of so great an inequality, and that the traffic must be conducted up the mountain by mules, as at the present time.

Cuba.—At the date of the last arrivals, the attention of Governor Jacon was much occupied with experiments upon the Batabano Railway, with the steam locomotive engine which had arrived from England some time before. The Railway was not quite completed in the neighbourhood of Batabano, but the entire line would probably be opened, with the commencement of the business of the ensuing winter months. The port of Havannah was very sickly, and almost destitute of shipping, as usually is the

case at that season of the year. It may give some opinion of the value of this magnificent island, to remark that the imports of the past year were valued at 22,551,969 dollars; and the exports 15,398,248 dollars; whilst the number of ships entered at the various Custom-houses was 2,353; making an agregate of trade considerably greater than the island of Jamaica itself. Hence it is seen that the introduction of the Railway system is by no means premature in so wealthy an island. Railways and steam locomotive power are peculiarly adapted to hot climates like that of Cuba, where the abbreviation of human and animal labour is so much more to be desired than in colder and more populous countries.

Isthmus of Panama.—A contract was entered into in the course of the recent year, between the government of New Granada and a French gentleman, for the construction of a Railroad across the Isthmus of Panama; but it does not appear that a commencement had been made at the latest dates. There are only twenty-one miles of land between the port o Panama and the city of Chagres, which is upon the river of the same name, which falls into the opposite sea. But, though this comparatively small distance intervenes between the waters of the Pacific and Atlantic Oceans, it is unfortunately a most mountainous tract of country, and the difficulties of forming a Railroad very great, if carried in a direct line. The present contractor has, however considerable powers as to the choice of his line, and large privileges as to the land and materials required.

In *Brazil* we find that a number of short Railroads are proposed, for the purpose of overcoming the difficulties arising from the interruption of the navigation of the principal rivers by sand bars. At these positions it is proposed to form Railways upon the banks of the river, and for the present to construct them entirely of wood. A company had been formed for the purpose of running omnibuses in the city of Rio de Janeiro, and the vehicles were to be ordered from England forthwith.—*Railway Times.*

ENGINEERING WORKS.

Thames Tunnel.—We are glad to find that the public can again be admitted to view this stupendous undertaking, it appearing that the whole of the water and strata of sand, clay, and gravel, which had forced their way into the tunnel during the last eruption of the river, have been entirely cleared out. We are also happy to understand that along the comparatively short distance which the works have now to progress to low-water mark at Wapping, a more effective covering o. the bed of the river is about to be deposited, by permission of the Thames Navigation Committee.

A new lighthouse, which will cost £5,000, is about to be erected by the Trinity House, near that point in the Isle of Wight off which the unfortunate ship Clarendon was wrecked last year.

Safety Valves for Steam Boilers.—M. Sorel has announced to the Academy of Science, that his safety valves for the security against explosion in steam boilers are completed, and requested the appointment of Commissioners to examine them. The apparatus is fixed to a steam boiler in the manufactory of M. Bourdon, Engineer and Machinist, Fauxburg du Roule, Paris.

[The above notice furnishes no clue to ascertain the value of this safety apparatus; we shall be happy to publish any description of the valves, and also any account of experiments entered into by the Commissioners appointed by the Academy, with which the Inventor may favour us.—Ed.]

Embankments from the Sea.—There seems to be no operation connected with agriculture which promises more immediate and important results that the reclaiming of submerged lands in the estuaries in our large rivers. Till within these thirty years, the sole object contemplated in embanking submerged grounds, seems to have been the exclusion of water from the surface of soil which required only to be protected from its occasional invasions, and kept dry merely to make it eminently fit for most productive cultivation. Within the last twenty years, a system has been entered on, and is now, in the Forth and Tay in particular, being carried out to the most astonishing extent, not only of bringing into a cultivable state lands already, but for the periodical submergence, fit for cultivation, but of causing rivers to precipitate their mud in convenient localities, and so of creating fields where nothing before existed but a gravelly river bed, covered by from eight to twelve feet of water every tide, of the most unprecedented and unlooked for productiveness.

In the Forth, 350 acres of this sort of land have been, in the last twelve years, reclaimed by Lady Keith, at a cost of about £21,000, and affording an annual return of about £1,400, or nearly seven per cent. In the Tay, seventy acres have been recovered opposite to the shores of Pitfour, 150 on those of Errol, and twenty around Mugdrum Island, making in all 240 acres, at about an outlay of £7,200, yielding an annual rent of about £1,680, or upwards of twenty-three per cent. On the Errol estate alone, 400 acres are just about to be embanked, in addition to the above 150, all of which may probably be in cultivation before 1847. Off the shores of Seaside, a wall just now being built, 800 yards in length, will effect the recovery of not less than 150 acres; and on Murie property, 60 acres might be taken in by seed-time 1838. The operations of the embanker, which began off Pitfour in 1826, will thus probably have been brought into cultivation before 1816, on a shore of not more than seven miles in length, no less than 810 acres of land, renting at from £6 to £7 per acre, or of a gross annual value of £5,670, and a gross total value, at twenty-five years' purchase, of £141,750. This is a clear creation of £117,450 of new agricultural capital, taking the reclaiming cost at £30 an acre. The junction of Mugdrum Island to the north shore would probably afford 1000 acres at a single operation, while thrice that surface might be obtained betwixt Errol and Invergowrie.

The capabilities of the Forth, over and above what has already been effected above and below Kincardine, are not much, if at all, behind those of the Tay, though no sufficient inquiry has been made to permit details to be gone into.

The basin of Montrose affords a surface of nearly 3,000 acres, all capable of embankment, and which, by being relieved of the salt water of the ocean, which every tide at present overflows them and keeps them submerged for twelve hours out of every twenty-four, and irrigated by the fertilizing current of the Esk, which, for at least forty days every season, bears along with it not less that 1.800th part of its weight of the richest mud, might speedily be made not less productive than those of the Forth or Tay.

It is probable that between North Berwick and Montrose are to be found the most favourable localities for embanking on the east coast of Scotland, if not indeed the only ones which could be made available with a sure prospect of profit. It would be at the same time wo l that the débouches of all our great rivers were examined, lest at the mouths of the Spey, the Dee, the Don, the Esk, and the Tweed, might lurk localities equally accessible to the embanker, and equally unlooked-for, more than in the Tay or Forth thirty years since.

If the harbours on both sides of the Forth be examined, as low down as Dunbar on the one side, and Crail on the other; and those on the Tay down to Broughty Ferry; those on the Esk to Montrose and Ferryden, larger quantities of silt will be found accumulating in each of them, quite as impalpable and fine, and probably, if freed of salt, as fertile as those deposited and taken in higher up the rivers. It is probable, then, that lands might be embanked much farther out in these estuaries than seems at present to be suspected, by much the greater part of the agillaceous flocculi which the river bears along with it being actually carried out to sea.

The various embankments hitherto completed have been constructed by those manifestly little acquainted with hydraulic engineering, with little concert amongst the proprietors, and without almost any recognition of general principles or systematic plan of procedure. Many anomalies are consequently apparent in the now finished works, and many cases of useless expense and annoying inconvenience have arisen which it would have been most desirable and no difficult to have avoided.

On these and on many other grounds which must be apparent, but to enter into a detail of which would be much too tedious for the present memoranda, it seems most important that something should be done in the way of an historical account of all the embanking operations of any importance in Scotland, whether for the purpose of merely defending lands previously existing, but liable to periodical inundations, from tides or river freshes, or for the purpose of obtaining and enclosing accumulations of silt, which, but for the skill and industry of man, would have been wholly swept away.—*The Quarterly Journal of Agriculture, Scotland.*

NEW CHURCHES AND PUPLIC BUILDINGS.

Trowbridge Church, Wilts.—The notice of this edifice, in our last Number, was incorrect in some of the particulars. We have received the following corrected statement.—Plan, cruciform, with a tower over the *south* transept. Style, early English, about the latter end o' the thirteenth century. Material, stone. Interior, vaulted ceiling to the whole, with nave and side aisle groining. Accommodation, 1,026 persons, with but one small gallery at west end for 100 children. Dimensions, extreme length inside, from east to west, 109 feet, extreme width inside, from north to south walls of transepts, 96 feet. Cost, 4,760*l.*

Portsea.—A church capable of containing 1,200 persons, with galleries on north, south, and west sides, is about to be erected in this parish, from the designs, and under the superintendence of Augustus F. Livesay, Architect, Portsea. The church to be in the form of a cross, with nave, transepts, and a chancel. Style: early pointed English Dimensions, extreme length inside, from east to west, 88 feet, extreme breadth in transepts, from north to south, 63 feet. Cost, 2,900*l.*

Newtown, Hants.—The beautiful little church recently built at this place, as the last and noblest act of the late corporation, and under the superintendence of A. F Livesay, Esq., Architect, of Portsea, was consecrated on Nov 1, 1837, by the Bishop of Winchester. After the service was concluded, his lordship stopped to admire the beauty of the structure, which he was pleased to designate as 'Newtown Cathedral,' declaring, that in his extensive diocese it was second only to the church at Old Gatton. In this, we believe, his lordship was perfectly correct; for the uncommon beauty of the church, together with the surpassing splendour of the great east window, will make it a special object of attraction to the tourist."—*Hampshire paper.*

Leeds.—A cruciform church, in the perpendicular English style, 66 feet long and 27 feet wide, the chancel 22 feet by 20, and the transepts 18 by 20 feet each, with gallery at the west end, to contain 600 sittings, is just completed, at Headingley, in the borough of Leeds, Yorkshire, from the designs, and under the superintendence, of R. D. Chantrell, Esq., of Leeds, F.R.I.B.A. It has a tower at the west end, with octagon, belfry, and spire, together 97 feet high; total cost, 2,450*l.*, including hot-water apparatus. Professor Murray's lightning conductor is attached to the spire: this is constructed with ½ inch copper tubes, screwed to a cap, gilt point at the summit, and terminates at the base in a stone trough of water, supplied by the waste water-drain from the supply cistern for the warming apparatus. This church is built by subscription of the inhabitants of the village. it is built with a millstone grit, from Watwood, near the place.

Skipton.—A church, in the early decorated style, was begun last June in Skipton: length 72 feet, breadth 52 feet; octagon pillars and arches supporting a clerestory; the side aisles are each half the breadth of the nave; the chancel is 32 feet by 21, rises nearly to the height of the nave, and has side aisles to appearance externally, which form the entrances, vestry, and robing room; the seats (pews and free) are all formed alike, are 3 feet in width, and, allowing 20 inches for sitting, the body contains 540 sittings; the chancel or choir is raised by five steps, and the pulpit and reading-desk are on each side of the chancel arch; the tower is 16 feet square with a. The church is built upon a low site, and the greater part of the foundation is upon a bed of concrete, the east end being upon clay, and the west upon gravel and loose sand · the whole is vaulted with stone; the average depth of the vaults 12 feet, to suit the site, and elevate the ground floor to the level of the Canal Bridge adjacent. The cost will be 4,000*l.* R. D. Chantrell, Esq., F.R.I.B.A., Architect.

New Churches have been recently built at Milnthorpe, Westmoreland; Tintwistle, Chester; Bamberbridge, Lancaster; Colchester; Augworth, Lancaster. Southport, Lancaster, called Trinity Church. It is a neat composed brick building, in the early English style, with a tower; it is calculated to accommodate 500 persons. Goring, Sussex. The erection of this beautiful church, on the site of the old one, has cost, including its six bells, about £6,000, which has been solely defrayed by David Lyon, Esq., who has a seat near.

St. Dunstan's, Stepney.—Three large Gothic churches are now building in this extensive parish; one near Arbour-square, Commercial-road; one at Mile-end, and one at Ratcliffe.

Additional churches will be shortly built in the parish of St. George in the East.—*Gentleman's Magazine.*

New Church, Ratcliffe, in the parish of Stepney, is being erected under the direction of E. Lapidge, Esq., Architect; the form of plan is a parallelogram, 75 feet in length and 49 feet wide, with side and end galleries; the style is early English; it has a bell-

turret and spire, the base of the turret forms the entrance vestibule; the material brick with stone dressings; accommodation for 1,022 persons; contract under £4,000.

Liverpool.—A new Church is proposed to be erected by subscription at Waterloo, near this town; and three more in the immediate neighbourhood, on the Cheshire side of the Mersey. One is now in the course of building at Accrington, near Blackburn, in the early English style, with a tower and spire; to accommodate about 1,600 persons. It is to be built of the hard freestone of that district, and is estimated to cost £5,000. The architect is A. Y. Williams, Esq., Liverpool.

Hawley Green Church, Yately, Hants.—This Church was consecrated on Thursday, the 21st of December, 1837, by the Lord Bishop of Winchester. The church contains 306 sittings; nearly one half of which are free. The cost of the church alone is within £700 and the total expense, including fences, amounted to £970. The corner-stone of this church was laid on the 28th of July last, and the whole has been completed within the short space of five months. It is a very neat Gothic structure, with plain lancet windows, and bell turret at the west end. Robert Ebbels, Esq, of Trysull, Wolverhampton, Architect.

The Parish Church of Windlesham, Bagshot, Surrey, is about to be considerably enlarged, under the directions of Robert Ebbels, Esq., of Trysull, Wolverhampton, Architect.

Wincanton, Somersetshire.—A National School is now erecting from the designs, and under the superintendence, of R. G. Clark, Esq., Architect, of Bognor, Sussex. The building is of stone, and in the Gothic style, the first stone was laid by the Bishop of Bath and Wells last July, before a large concourse of people. It is to contain 240 children, the cost is £500. C. N.

FOREIGN INTELLIGENCE.

GERMANY.

The Cathedral at Halberstadt, which is justly esteemed one of the most admirable monuments of Gothic architecture in the north of Germany, has been fully described and illustrated in a folio volume, with seven plates, by Dr. Lucana, of Berlin. Of this church, the older part was begun in 814; but the first structure having been nearly destroyed by Henry, surnamed the Lion, in 1179, the present edifice, or addition to what remained of the former one, was commenced in 1181, and consecrated in 1220. The works, however, continued to be carried on long after the last mentioned date; the choir, for instance, not being finished until the following century. As shown in two views, plates 3 and 5, the interior of the church is highly imposing, and the painted windows of the choir and Bishop's chapel produce a rich and harmonious effect. The grandeur of the edifice generally is fully equalled by the variety and elegance of the ornamental details, which are so numerous, that they alone would furnish a series of architectural studies of considerable extent. The Bishop's stall is esteemed one of the greatest ornaments in the church, and is, in fact, a most exquisite piece of design, in which fertility of invention, ingenuity, and taste, are complete with each other.

Bavaria.—On the 6th of December, a meeting was held of the two Committees of the Augsburg and Munich Railway, one from Augsburg and the other from Munich, at which all differences were adjusted. We may, therefore, hope that all the obstacles which have hitherto opposed the execution of this line, one of the most promising and interesting in Germany, will now be removed. The delay which has occurred in the progress of this useful undertaking, in a country which has of late years become famous throughout Europe for its advances in public improvement, has occasioned not a little surprise, and, it has been hinted, would never have taken place had the Government shown half as much interest in the furtherance of a railway as of a picture-gallery or a "Valhalla."

Pesth.—Of two new edifices in this city, one is now completed, the other now in progress. The former is the National Hungarian Theatre, which was opened in August last: it was erected chiefly by voluntary contributions, and is said to be fitted up in an exceedingly tasteful style. The other is for the National Museum, and will, when completed, be the largest building in the whole city.

Hamburg.—Some time ago there was a competition for the new Exchange, to which foreign architects were invited, by public advertisement, to send in designs. The committee have now adjudged the first premium (100 louis d'ors) to Zwirner, of Cologne; and the second (100 ducats) to Maack, of Hamburg. Whether any designs were sent from this country, we have not heard.

Italy.—We are happy to learn that surveys are now making of the line of railway from Venice to Milan. The engineers who are employed are under the direction of Signor Milani.

LAW PROCEEDINGS

Bristol and Exeter Railway.—On Monday last, the 27th of November, an Inquisition was held at Weston super-Mare, before the Under-Sheriff, Edward Coles, Esq., and a highly respectable Jury, to assess the value of land required by the Bristol and Exeter Railway Company from C. H. Payne, Esq., at Uphill.

The damages were thus assessed by the Jury:—

The value of the land	£98 10 0	
Compensation for severance	58 0 0	
		£156 10 0

After delivering the verdict, the Foreman added, "That the Jury desired to express their unanimous opinion, that the conduct of the Company throughout the transaction had been highly honourable and liberal, and entitled the Directors to the entire confidence of the landowners, that they would be fairly and equitably dealt with in their negotiations and arrangements with the Company."—It was given in evidence that the Company had offered Mr. Payne 200*l*., in order to avoid the expense of proceedings before a jury. By the 30th section of the Act of Incorporation it is provided, that in case of a verdict for a less amount than had been previously offered by the Company, a moiety of all the costs, charges, and expenses of summoning the jury, and of witnesses, is to be borne by the owner of the land, and may be deducted from the sum awarded.—*Bristol Gazette.*

MISCELLANEA.

British Museum.—Within the last month, two new rooms have been opened to the public, in the gallery on the west side of the building, over the gallery of antiquities, the approach to which is from a spacious stone staircase at the extremity of the latter. One of these is devoted to Etruscan antiquities, several of which have been removed from the room known as Sir William Hamilton's collection; and the other expressly to the monuments and records of ancient Egypt. Of these there are several mummies and mummy-cases, the names of the owners of which have, as far as could be deciphered from the hieroglyphics, been attached to them: some of the latter are very rare and curious. The collection has lately received many rare additions of the household furniture and implements of this interesting nation; and amongst the most singular relics must not be omitted those votive offerings which were placed within their vaults to nurture the spirit on its passage to the other world. One of these relics, along with a basket of fruit and different varieties of bread, consists of three baked fowls, which are as firm and attenuated as the bodies of those for whose nutriment they were furnished.

Hydraulic Telegraph.—A novel and ingenious method of conveying intelligence from one place to another has lately been invented by Mr. Francis Whishaw, of South-square, Gray's Inn. The principle on which the process is carried on depends on the well known fact of water always finding its level. The invention is worked by the rising or depression of water, and is therefore appropriately called the "Hydraulic Telegraph." In the experiments which have been made, sentences of several words have been communicated with the greatest rapidity from one room to the other, and the interpretation, although the vocabulary of Mr. Whishaw at present has not above 12,000 words, has been perfect. The rough estimate of the expense of a telegraph of this sort, including stations and contingent expenses, is 200*l*. a mile. The invention is exceedingly curious, though dependent on a well known and simple principle.

Means of Conveyance in the United States.—Notwithstanding the late commercial calamities with which we have been visited, and notwithstanding that the tolls on the Erie Canal, the great channel by which commerce flows from the mercantile emporium of this country towards the far west and the lakes, have decreased, it is gratifying to learn, by the late statistical returns of the canals and railroads of Pennsylvania, from Philadelphia to the west, that instead of a decrease, there has been a considerable increase in the amount received during the past year, as compared with the previous one. The amount of canal and railroad tolls received in Pennsylvania, for the fiscal year, ending on October 15th last, was 892,384 dollars, being 54,578 more than the preceding year. I dwell upon this fact emphatically, because these railroads and canals are the grand highways between the Atlantic cities and the western states and rivers. It is true, had not the pressure, to which I have so frequently alluded, taken place, a great increase would have been apparent in the tolls above referred to, and hence in the general business of the country. As it is, the increase has been by no means inconsiderable; and it proves that no circumstances, no temporary panic, can repress the energies of this mighty people. While upon this subject, and with a view of showing the enterprise and liberality of individual states, I may mention the fact, that the great line of canals and railroads connecting Philadelphia with Pittsburgh, and thus the waters of the Delaware and the Ohio, has cost Pennsylvania upwards of 20,000 dollars! The consequence is, that the people of the commonwealth of Pennsylvania have been very heavily taxed, and yet they are as decided and unequivocal in their attachment to all judicious and proper improvements as ever. Even now they are making arrangements for a great railroad to connect Philadelphia with the lakes, and thus to afford a new channel for the united wealth of the "Great West."—*Philadelphia Correspondent of the Morning Chronicle.*

Grand Junction Railway.—Early on Friday morning last, one of the bridges under the railway near Warrington gave way, owing to a very heavy fall of rain, which had inundated a large tract of country between Warrington and Manchester, and which, in flowing through the bridge, washed away the earth between the piers, and thus undermined the foundation. A temporary bridge of wood was soon erected, across which, during the whole of Friday, passengers with their luggage had to pass. In this way a delay of about half an hour was involved. The directors met in the course of the day, and issued a notice that until another bridge was constructed, passengers would be liable to the inconvenience of changing luggage; but before this notice was published, by the activity of the company's agents, a wooden bridge for carrying the railway was constructed, across which all the trains on Saturday passed, and business has since proceeded as before. Mr Locke, the company's engineer, who was in London attending a trial at Guildhall, was sent for by express, and reached Warrington early on Sunday. He expressed himself quite satisfied with the measures that had been taken, and is now proceeding to rebuild those parts of the bridge that had been carried away.

Liverpool, Dec. 25, 1837.

TO CORRESPONDENTS, AND NOTICES.

We consider the Spring Wheels of Mr. Mackenzie's wholly inadmissible in practice, their complexity, the expense of construction, and liability to derangement is such, that we could not recommend their adoption in any case. The Drawings, which are very beautifully done, are at our Publisher's Office, and may be had on application.

"An Architectural Student", is informed, that the qualification of Competitors for Prizes proposed by the Architectural Society, is, that they must be Members of the Society.

We cannot answer Mr. Prosser's inquiry with confidence, as to the correctness of the description in Moore's Improved Almanack for 1838, relative to "Compressed Bricks being cheaper than ordinary bricks, and harder than granite." (!!) We very much doubt both statements. We had intended to have continued a series of experiments on the strength of bricks, which we commenced some time since, but our professional engagements have prevented us; as soon as we can spare time we will proceed with them, and then put to the test whether "compressed bricks are harder than granite." In the mean time we shall be obliged for any communication on the subject.

We regret that we have not space for Mr. Davy's communication in our present number; also those of J. J., an Old Engineer, and other Correspondents.

Books for Review should be sent early in the Month—Communications on or before the 20th—and Advertisements on or before the 25th Instant.

DRAINING BY STEAM-POWER.

Fig. 1.

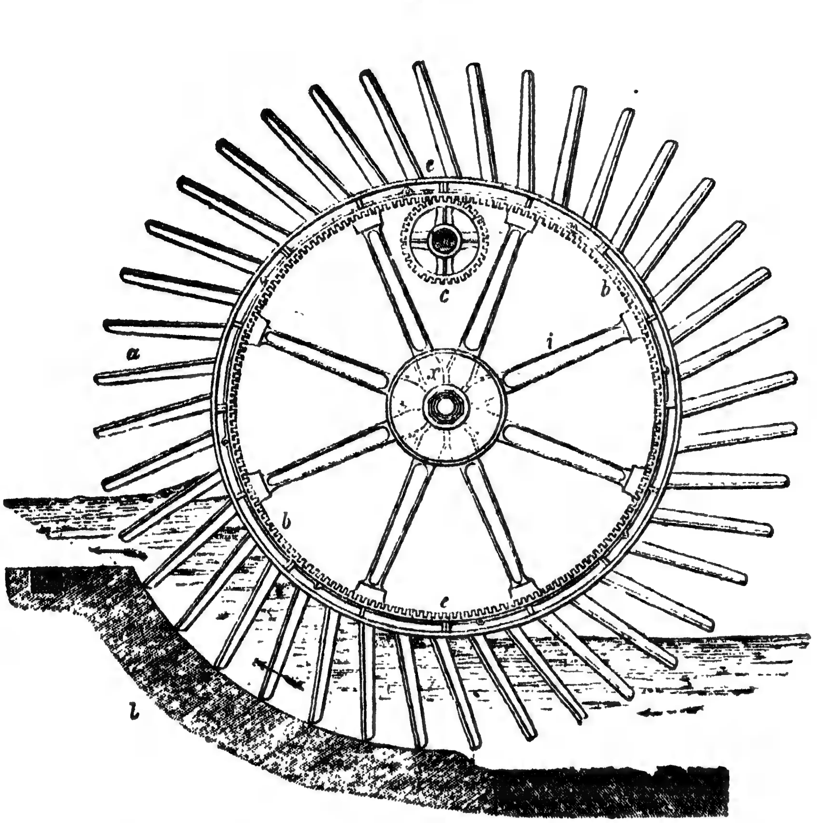
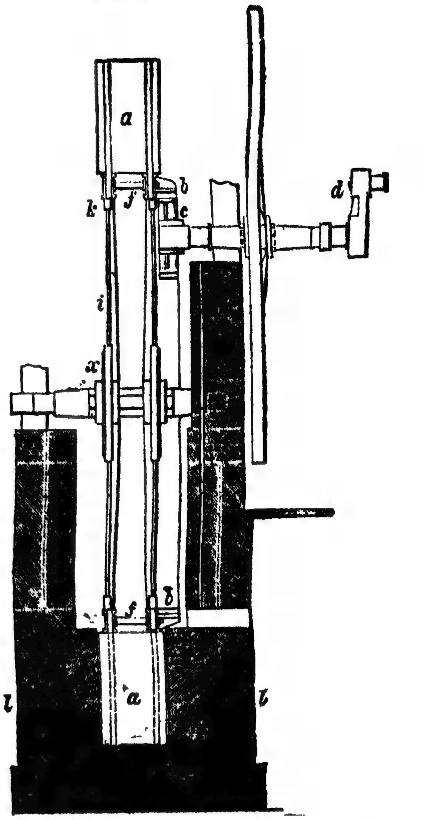


Fig. 2.



TRANSACTIONS OF THE SOCIETY, INSTITUTED AT LONDON, FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

Vol. LI. London, 1837.

This Society, which may be considered the parent of most of our Scientific Institutions, has been established upwards of eighty years, and has distributed, in premiums and prizes for the encouragement of the arts and improvements in manufactures, &c., several thousand pounds in money and medals; through its medium has been brought to light many valuable inventions which otherwise would have been lost to the world; many men, now standing high in their professions, recollect well that feeling of enthusiasm which has supported them through all the difficulties of their progress towards distinction, was excited and kindled, in the first instance, by the rewards and commendations of this society; the valuable collection of models in the museum, and the many excellent papers annually published in the Transactions of the Society, fully attest its value to the public.

The disbursements of the Society are maintained, for the most part, by the trifling subscription of two guineas annually by members; but we conceive that a society so valuable and so national ought to receive the support of every friend to the improvement of the arts and education generally, and this is the more to be desired, as its finances are not now in so flourishing a condition as formerly; so that unless public patronage be extended towards the institution, its means of doing good will be materially curtailed.

The subscriber is entitled at all times to free admission to the museum and extensive library—the meetings, conversaziones, and various committees, each one affording a field for instruction and improvement.

We insert an essay on Draining, by Joseph Glynn, Esq., published in the last volume of the Transactions, as one proof amongst many of the highly useful and well-written papers abounding in them—a paper which may be read and studied by every man, professional or otherwise, with exceeding advantage.

"The Gold Isis Medal was voted to Joseph Glynn, Esq., Civil Engineer, for the following communication on his application of Steam Power to Draining Fens:—

Butterley, by Derby, Feb. 8, 1836.

"Sir,—I have thought it my duty to submit to the Society some account of a very important application of the steam-engine, which at present appears to be but little known beyond the immediate localities where it has taken place, and which has been successfully made in several extensive works wherein I have been engaged, for the drainage and improvement of fens and marsh lands, chiefly in Lincolnshire and Cambridgeshire, and which I believe would be found of great advantage in many other parts of England.

"As the introduction of the steam-engine, on the large scale, cannot, I presume, be uninteresting to the Society, which alike patronises agriculture and the arts, I trust I shall be excused in venturing to lay before you the following observations, illustrated by plans of three of the principal works of this kind, which have been executed under my superintendence.

"Although much has been done in the fen countries to improve the outfalls of their rivers, and to promote as much as possible the action of natural drainage, yet many districts are so situated, that, without the aid of mechanical power, they must still have remained little better than waste swamps, affording only a precarious summer pasturage for cattle.

"The introduction of the wind-engines, or Dutch mills, was therefore of great utility, as their use enabled the fen farmers to throw off a large portion of the water, and, by raising the banks round their districts, they kept them so far dry, that in favourable seasons they reaped abundant harvests, the great fertility of the soil returning them large crops of wheat when brought into tillage.

"But here the farmer was subject to great risks. Often, when his crops were almost ready for the sickle, he had the mortification to see the rain fall in torrents when there was not a breath of wind to turn his mills, which stood motionless with their sails spread to catch the vainly expected breeze, whilst the produce of his fields perished on the ground.

"The aid of the steam-engine is, therefore, invaluable in the fens; and the extent and fertility of these lands, when properly drained and cultivated, render them an object of almost national importance. The fen districts in the Bedford level alone amount to nearly 300,000 acres, and the whole of the fen and marsh lands in England is, perhaps, not less than 800,000 acres.

"In one of the districts where I was employed, I found the rich black earth formed of decomposed vegetable matter, to be upwards of thirty feet in depth.

"Few persons, I believe, are aware how small a quantity of mechanical power is sufficient to drain a large tract of fen land. Generally speaking, there are no natural springs; and when the upland waters are banked out and carried into the rivers by catch-water drains, we have to lift that water alone which falls from the clouds. The quantity of rain which descends on the flat eastern counties of England, is less than in any other part of the island, seldom exceeding 26 inches in depth in the year, whilst in the hilly western counties of Lancaster and Westmoreland it often amounts to 54 inches in depth. It would seem almost like an arrangement made by Providence to place the cultivation of these rich lands within the compass of our ability.

"In many months the evaporation is greater than the downfall, and it then becomes necessary to open the sluices, and let in water from the rivers to moisten the earth and to supply the cattle, which, when steam-engines are used, may be done without fear.

"If the wind-engines could be depended upon, they might be rendered sufficient for the purposes of artificial drainage; but it unfortunately happens, that when there is most rain there is generally least wind, and the mills are useless when all depends on them. The steam-engine ensures certainty; it is ready to act whenever it may be wanted; and the first cost and subsequent maintenance of one powerful steam-engine is less than the expense of building, repair, and attendance on a great number of windmills. In one large district where I was employed, named Deeping Fen, near Spalding, and now drained most effectually by two steam-engines, there were forty-four windmills for lifting the water.

"I would here remark, that I do not claim the merit of having originated the idea of employing the steam-engine in the drainage of land. It did not escape the great mind of Smeaton, who gave it as his opinion, that it would one day become a powerful agent in the improvement of the fens; and subsequently his pupil and successor, the late Mr. William Jessop, I believe, on one occasion, unsuccessfully recommended its adoption. Afterwards, the late Mr. John Rennie endeavoured to introduce steam-engines into the fens, but he could only prevail on the proprietors of one district to erect a small steam-engine in aid of their windmills, consequently it had not a fair trial; and here the matter rested for many years.

"I am happy, however, in that I have been able to realize what these great men had imagined; and in so doing, I have not only caused "two blades of grass to grow where but one grew before," but I have had the pleasure to see abundant crops of wheat take the place of the sedge and the bulrush. I have been fortunate, in that I have been permitted to carry these improvements to a greater extent than I could possibly have anticipated; and, whilst I confess myself ambitious of obtaining some mark of the Society's approbation, I trust that, through the means of their widely-circulated Transactions, the knowledge of these things may be further extended, not only in England but on the Continent; and that when it is known by what comparatively small means the swamp or marsh, exhaling malaria, disease, and death, may be converted into fruitful corn-fields and verdant pastures, the blessings of health and abundance may be still more widely spread. I beg to apologize to the Society for this digression, which has led me away from the practical part of my subject.

"In most cases it is not requisite to raise the water more than three or four feet higher than the surface of the land intended to be drained; and even this is only necessary when the rivers into which it is delivered are full between their banks, from a continuance of wet weather, or from upland floods.

"In some instances, the height of water in these rivers is affected by the tides, so that drainage by natural outfall can only take place during the ebb; in others, the rivers, uninfluenced by the tides, form the means of drainage, but have not fall or descent sufficient during heavy rains to carry off the water.

"In all these cases I have erected steam-engines for draining marsh land with complete success, and the plans* which accompany this paper will explain their application.

"I have stated, that the quantity of rain fallen in the fens on the eastern side of the island seldom exceeds 26 inches in the year; and that it is with the rain alone we have to contend, the upland waters being banked out, and there being no springs in the fen. If there be rising ground within the district, or uplands adjoining, whose waters cannot be banked out, the surface of such lands must be taken account of in our calculations as if they formed a part of the district.

"If we suppose that in any one month there fall 3 inches depth of rain, of which 1 inch is absorbed and evaporated, we have $1\frac{1}{2}$ cubic feet to every square yard of land; and this multiplied by 4840 (the number of square yards in an acre), gives 7260 cubic feet of water to the acre.

"I have found it expedient in practice, to keep the water in the drains within the district about 18 inches below the surface of the cultivated land; and if we must raise it $3\frac{1}{2}$ feet higher than the surface, which happens very generally to be the case, especially when the water is high in the rivers, our lift between the surface of water in the drains and that of the outfall river will be 5 feet. I have generally caused the principal or main drains to be cut $7\frac{1}{2}$ feet deep, and of width to give them sufficient capacity to contain the rain-water as it falls, and to bring it down to the engine, keeping it in full work within a descent or declivity of from $1\frac{1}{2}$ to 3 inches in a mile.

"I have always used scoop-wheels, the float-boards of which dip 5 feet below the water's surface where powerful engines are used, or $6\frac{1}{2}$ feet below the land in the level of the fen.

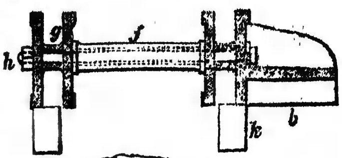
"The main-drains, then, are 1 foot deeper than the wheel-track, which allows for the deposition of mud and weeds, and facilitates the flow of water to the wheel. Such a wheel, in technical language, will be said to have 10 feet head and dip.

"These scoop-wheels I have made of cast-iron, with wooden float-boards, like the undershot wheel of a water-mill; but, instead of being turned by the impulse of the water, they are used to lift it, and are kept in motion by steam power.

"The details of the construction of these wheels are shown in the engraving.

* These plans, which consist of a very elaborate and excellent set of drawings, are deposited in the Society's collection, and are open to examination by those who are interested in such works.

Fig. 3.



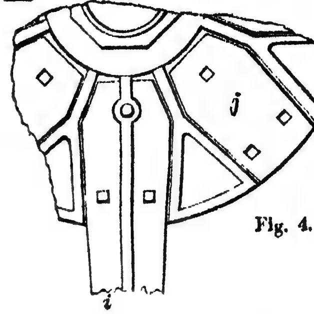


Fig. 4.

Fig. 5.

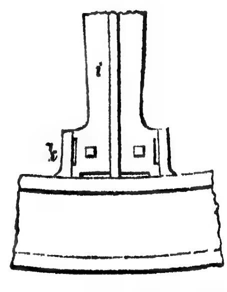


Fig. 6.

"Fig. 1 is a side view of the scoop-wheel.

"Fig. 2 is a front sectional view of the same, showing only the top and bottom paddle-boards and pairs of arms, and one top and one bottom tooth.

"*a a* the paddle-boards, each fastened to its pair of arms; *b b* the ring of internal teeth, which are engaged by the toothed wheel *c*, having on its axis a fly-wheel and a crank *d*, by the latter of which it is connected with the prime mover.

"The wheel is composed of 2 pair of rings, an outer and an inner in each pair, one of the latter of which is the ring of teeth *b b*, already mentioned. Each ring is cast in eight segments, which are joined as shown at *e e*, fig. 1. These four rings are kept in their proper places by several sets of hollow pillars, each set consisting of one long and two short ones, as *f* and *g g*, fig. 3; one long screw-bolt *h* passes through the three pillars, and also through corresponding holes in the four rings, and thus binds the whole firmly together. Each pair of rings is connected with the common axis by a set of arms or spokes *i i*, &c., the converging ends of which are secured in a circular flanch *x x*, fixed on the axis.

"The form of the recesses in the flanch into which the ends of the arms are fitted is shown in fig. 4, where *j j* are two such recesses, and *i* is an arm in its place, and made fast by three bolts. Fig. 5 is a cross section of an arm. Fig. 6 shows the outer end of one arm, and part of a ring: it is fitted into a recess or box *k*, which projects from the rim, and is secured by two bolts. These latter are cast with the two outer rings, as shown in the transverse section, fig. 3, *b*; in the same figure, is one tooth of the ring of teeth, fig. 1. The close fitting of the masonry that forms the channel for the water in which the paddle-boards *a* work, is shown in cross section *l l*, fig.2, and at *l*, fig. 1, in longitudinal section.

"The float-boards move in a track or trough of hewn stone or masonry, worked to fit them, as shown in the figure, the lower end of this wheel track being open to the main drain, the upper end communicating with the river, which is kept out when the wheel ceases working by pointing doors, like the lock gates of a canal. The float boards do not radiate from the centre of the wheel, but form an angle of forty-five degrees with the horizon at the point where they deliver the water.

"The diameter of the scoop-wheel should be such, that the surface of the water in the outfall drain or river may never rise higher than within four or five feet of its axis, otherwise the water might pass over the float-boards, and flow back again into the fen.

"I have found about six feet in a second to be the best speed for the circumference of the wheel, as that velocity gives sufficient centrifugal force to hold the water up against the "breast" of the wheel-track or trough of masonry, and yet not so much as to cause its being carried up by the float-boards past the point of delivery.

"As engineers, by common consent, make a horse's power to be equal to 33,000 lbs. raised one foot high in a minute, or 3,300 lbs. ten feet high in the same time, consequently, as a cubic foot of water weighs $62\frac{1}{2}$ pounds, and a gallon of water 10 pounds, a horse's power will raise and discharge from the fen, at ten feet high, 330 gallons, or $52\frac{8}{10}$ cubic feet of water in a minute.

"Now a good steam engine applied to work a scoop-wheel will consume about 10 lbs. of Newcastle coals in the hour for each horse's power, and in that time lifts and discharges 3,168 cubic feet, or 19,800 gallons of water (at a height of 10 feet) per horse's power per hour.

"I have taken the quantity of rain which may fall in excess on an acre of fen-land in a month to be 7,260 cubic feet, which one horse's power will raise and discharge in ($2\frac{29}{100}$ hours) about 2 hours and 20 minutes.

"Suppose, therefore, we wish to drain 1,000 acres of fen or marsh land, and that the upland waters are all banked out; we have an excess of rain equal to 7,260,000 cubic feet of water to raise and get rid of.

"A good steam-engine of 10 horses' power will do this in 232 hours, or less than 20 days, working 12 hours per day, and I have found these calculations fully supported in practice. It is true, that the rain due to any given month may fall in a few days, but in that case the ground absorbs a good deal of it, and I have before observed that the drains must have capacity enough to receive and contain the rain as it falls; besides, in case of need, the steam-engine may be made to work 20 hours per day instead of 12. It is also true that, as the dip of the wheel lessens, the quantity of water discharged is

[illegible] safe, for the upper edges of the float-boards are 18 inches below the level of the land.

"In order to show what has been done in actual practice, I here beg leave to submit the results of an experiment made with one of the engines of 80 horses' power, which I have erected at Pode Hole, in Deeping Fen, near Spalding, Lincolnshire. The quantity of water thrown being ascertained by the contents of a portion of the main drain, partitioned off for the purpose by dams, properly planked and secured by puddling of clay.

Results of an Experiment made with the Eighty-Horse Engine at Pode Hole, on the 18th of July, 1830.

Time the Engine was at work.	Coal burnt.	Mean Lift at which the Engine worked.	Mean Dip of the Wheel.	Weight of Water raised per Hour.
	Bushels.	Ft. In.	Ft. In.	Tons.
1st hour's trial . . .	$12\frac{1}{2}$	6 $7\frac{1}{2}$	3 4	9,810
2d ditto ditto . . .	12	6 10	2 10	8,520
3d ditto ditto . . .	$11\frac{1}{2}$	7 2	2 6	7,560
4th ditto ditto . . .	11	7 5	2 2	6,660
5th ditto ditto . . .	10	7 6	1 10	5,700
6th ditto ditto . . .	10	7 6	1 6	4,740
7th ditto ditto . . .	10	7 6	1 3	4,220
8th ditto ditto . . .	10	7 6	1 2	3,990
	87			51,230

"The water-wheel is 28 feet in diameter, its float-boards are $5\frac{1}{2}$ feet in depth by 5 feet wide, and they travel with a mean velocity of 6 feet in a second. The section of the stream delivered, when the engine has its full dip, is, therefore, $27\frac{1}{2}$ square feet, and the quantity discharged is 165 cubic feet, equal to more than $4\frac{1}{2}$ tons of water in one second, or about 16,200 tons in one hour.

"It will be observed, that the float boards had only 3 feet 4 inches dip, instead of 5 feet 6 inches dip, at the commencement of the experiment, or, in proportion to the full dip, as 20 to 33, or as 9,810 tons, the quantity lifted in the first hour, are to 16,230 tons; so that the trial proves the correctness of the calculation.

"It will also be remarked, that had the wheel been working with a full dip, "the head," that is, the lift from surface to surface of the water, would have been only 4 feet 6 inches, instead of 6 feet $7\frac{1}{2}$ inches. At the end of the eighth hour the enclosed portion of the main drain, which was $6\frac{1}{2}$ miles in length, and averaged at the water's surface $34\frac{1}{2}$ feet in width, being so far emptied of its contents that the float-boards of the scoop wheel dipped only 14 inches in the water, it was useless to continue working the engine.

"The fuel used during this trial, was Yorkshire coal, of which the average consumption was about $10\frac{1}{2}$ lbs. per horse power per hour. From 8 to 9 lbs. of Newcastle coal would, with this engine, be found to do the same quantity of work.

"I have drained two districts of fen land, near March, in Cambridgeshire, where the engine's power bears about this proportion of 10 horses' power to 1,000 acres of land, and the water can always be kept down to any given distance below the roots of the plants. If the rain fall in excess, the water is thrown off by the engine; if dry weather prevail, they can open the sluices without risk, and let the water flow in from the river, to fill the drains and moisten the earth.

"The engines work about four months out of the twelve, at intervals varying of course with the season. Where the districts are tolerably large, and the drainage effected by steam power, the annual expenses, including all charges, will not exceed 2*s.* 6*d.* an acre. The first cost of the works varies, of course, in almost every district, from the nature of the substrata; but generally I have found that it amounted to about 20*s.* an acre for the requisite machinery and buildings: that is to say, an engine of 40 horses' power, with its scoop-wheel, machinery, and buildings erected for the drainage of 4,000 acres of land, cost about 4,000*l.* I have found this to be the case in four different districts.

"Where the clay or other firm measures lie near the surface, so that we can either dig down to them, or drive short piles, I prefer the steam-engines in the form generally used in cotton-mills and other manufactories, and commonly called by workmen, "factory-engines;" but where it is necessary to drive long piles, and to plank and cross-plank over them, so as to form an artificial foundation or platform to build upon, I prefer the "marine engines," that is to say, in the form usually adopted on board of steam-packets, which is more compact, requiring smaller and less expensive foundations.

"The districts wherein I have been employed are eleven in number; the quantity of land drained or improved is about 90,000 acres, and the steam power used is equal to 620 horses.

"In many places, persons who were able to foresee the consequence of these improvements, and to avail themselves of it, have purchased land at from 10*l.* to 20*l.* an acre, which they may now sell at from 50*l.* to 70*l.* an acre, producing from four to six quarters of wheat to the acre.

"Many of these gentlemen farm their own land; are commissioners by qualification; they live in abundance on the produce of their fruitful soil, and their hospitality and kind attention I have every reason gratefully to acknowledge.

"I will now mention these districts in the order their works were undertaken, with the quantity of land and the power used in each case, and attempt an explanation of the drawings sent herewith.

[illegible]

"Deeping Fen, near Spalding, Lincolnshire, in 1825, containing about 25,000 acres, is effectually drained by two steam-engines of 60 and 80 horses' power, the larger one being made entirely under my superintendence at the Butterly Iron Works; the 60-horse engine by Fenton and Murray. The scoop-wheels and machinery for both engines were entirely made and put together at Butterley, under my direction. The cast-iron toothed wheels used were of necessity very strong, more so, indeed, than any I had seen, being 15 inches in width across the face of the wheel, and the pitch of the teeth, 5 inches.

"March West Fen, adjoining the town of March, Cambridgeshire; in 1826, about 3,600 acres are completely drained by an engine of 40 horses' power, and it is in contemplation to add about 400 or 500 acres to the district to be drained by the same engine.

"Misterton Soss, with Everton and Gringley Cars, in 1829; comprising an extensive district between Bawtry and the river Trent, of about 6,000 acres, more than two-thirds of which are marsh land, is effectually drained by a 40-horse power engine.

"The engine is situate about three-quarters of a mile from the Trent, and the outfall drain from the engine to that river is contrived, during the rising tide, or when the Trent is flooded, to form a capacious reservoir, into which the engine throws the water until it acquires sufficient head to open the pointing doors at the Trent side, and discharge its contents into the river. This is done when the Trent is flooded; but in favourable seasons, the sluices by the side of the engine are raised, and the district is drained by natural outfall; these sluices are also used in dry seasons to retain the water in the district.

"1830, Littleport Fen, near Ely, about 28,000 acres, drained by two steam-engines of 30 and 80 horses' power, but with a few of the old wind-engines still retained. Before steam power was used, there were seventy five wind-engines in this district; and often has the Fen farmer, in despair, watched their motionless arms, and earnestly hoped a breeze might spring up to catch their sails, whilst his fair fields gradually disappeared below the rising waters, and the district assumed the appearance of an immense lake.

"The large engine was entirely constructed under my inspection, and built from my drawings, at the Butterley Works; the small one was purchased by the commissioners, and I afterwards repaired and adapted it, so as to make it available for their purpose.

"As it was desirable that the large engine should be erected on the bank of the Hundred Foot, or New Bedford River, in which the tide rises to a considerable height, a scoop wheel, of large size and great strength, was necessary, the head and dip being at times not less than 16 feet; but when the tide was out, the head was much diminished, and I therefore made two speeds, or combinations of wheel work; so that the scoop wheel might revolve with greater velocity, and throw a larger quantity of water during the ebb, whilst the engine's full power and uniform speed were maintained at all times.

"The foundation was naturally very bad, there being seven yards in depth of black peat above the clay.

"To resist and to work against so great a head of water, I was compelled to take artificial means to make it secure, and, accordingly, I caused upwards of 600 strong piles to be driven firmly down into the clay. Having spiked to the pile-heads, which were sawn off to a uniform level, stout cross sills of Memel timber, the whole was planked over with 3-inch deals laid close together, and spiked down to form a complete floor under the whole of the buildings, so that if any settlement took place they might sink equally. The works, however, have stood as firm as a rock.

"The scoop-wheel is 35 feet in diameter, and with its axis and the toothed wheel-work upon it, weighs 51 tons, to which, when in action, the weight of water upon it must be added.

"The pinion on the engine-axis is 4 feet in diameter; it makes 13 revolutions per minute, and weighs 33 cwt.

"When the tide is high, this pinion works into a wheel of 24 feet in diameter, having internal teeth; the float boards on the periphery of the scoop-wheel then travel with a velocity of 212 feet per minute, and in that time discharge 3,519 cubic feet, or 21,980 gallons of water. When the tide is low, the pinion, by the help of machinery, is made to slide into action with another wheel of 16 feet diameter, having external teeth, and the float-boards then move at the rate of 318 feet per minute, delivering 5,278 cubic feet, or 32,880 gallons of water in the same time.

"Before these works were completed, many persons who professed to understand such matters predicted their total failure, and greatly alarmed the commissioners for the result; but their success in saving the district from being drowned, during a long continuance of heavy rain, which, without their aid, must have laid the whole of it under water, gave unquestionable evidence of their efficacy. The commissioners were pleased to make a public expression of their thanks for my services, conveyed in terms most flattering; and, by printing their resolutions in the local papers, to induce other districts to follow their example.

"Middle Fen, near Soham, Cambridgeshire, about five miles from Ely, in 1832. About 7,000 acres are drained by a steam-engine of 60 horses' power. The foundation was similar to that in the preceding district of Littleport, and the expense and difficulty encountered in that instance led me to adopt the marine engine here: the drawings Nos. 5, 6, and 7, show the arrangement. My success in Littleport Fen led to this understanding, several of the commissioners having estates in both districts, as also in the following.

"Waterbeach Level, lying between Ely and Cambridge, containing about 5,600 acres, was drained in the same year by a 60-horse power engine. The foundation here is a natural bed of concrete gravel, held together by an ochreous cement; a large patch of this was found at the very point where it was desirable to establish the works at an accessible depth from the surface, so that we could build upon it.

"Magdalen Fen, near Lynn, Norfolk, in 1834, contains upwards of 4000 acres, and is completely drained by a 40-horse engine, under circumstances similar to the preceding; the water is discharged into the Eau Brink Cut.

"March First district, or Binnimoor Fen, in Cambridgeshire, 1834. 2,700 acres of land are kept in the finest possible state of drainage by a 30-horse power steam engine; the water of about 300 acres of adjoining high ground drains into the fen. This is, perhaps, the most complete work of the kind in Cambridgeshire. It lies close by the town of March, and the commissioners were, therefore, desirous that the drainage should be perfect: as they instructed me to spare no pains to make it so, I trust their wish has been accomplished.

"Feltwell Fen, near Brandon, Suffolk, about 2,400 acres, drained or improved by a 20 horse engine, now just completed.

"Soham Mere, Cambridgeshire, formerly, as its name implies, a lake, of 1,600 acres in extent, and about 300 or 400 acres of higher land, the waters of which cannot altogether be excluded. As the lift is great, it is requisite to employ a 40 horse engine. These works are now constructing; they are in a forward state, and will soon be in operation, I trust with success.

"I have exceeded the limits I at first proposed to myself, and, I fear, trespassed on your time; I therefore refer to the plans, which I hope will further elucidate the subject, and respectfully submit them to the Society.—I am, sir, &c. &c. JOSEPH GLYNN.

"A. AIKIN, Esq., Secretary, &c. &c.

"Whilst I was writing the preceding paper, I thought it expedient to apply to Mr. John Tricket, superintendent of the works at Deeping Fen, for an account of the quantity of rain which had fallen in his district during the last two years, and what quantity of water he had thrown off with the steam engines, to which I received the following reply:—

"Sir, *Pode Hole Engines, Feb. 11, 1836.*

"According to your request, I have sent you a copy of my log book for the last six years, knowing it would be better information for you than if I had given you the last two years only, as it gives some wet seasons. We are working day and night at this time, and, I am happy to say, are giving general satisfaction. The district we drain is about 25,000 acres. I am, sir, &c.

"JOSEPH GLYNN, Esq., Butterley, near Derby. "JOHN TRICKET."

"*Depth of Rain fallen, and weight of Water lifted at the Pode Hole Engines, Deeping Fen, near Spalding. (The district drained is equal to 25,000 acres.)*

		Rain fallen, inches depth.	80-horse lifted	60-horse lifted
1830.	January	3·25 inches	1,529,520 tons	316,110 tons
	February	4·6	4,097,100	2,791,560
	March	·11	713,880	388,020
	April	2·75	1,401,060	
	May	4·7	1,638,660	
	June	4·63	3,001,610	181,110
	July	3·2	1,156,570	133,920
	August	2·125	23,160	
	September	4·79	1,675,920	
	October	·63	952,500	150,060
	November	1·87	670,320	879,840
	December	1·3	2,741,580	330,540
	Total rain	34·285	19,934,910	5,204,820
	No. of days (12 hours each) worked		By 80 horse, 219	By 60 horse, 73¾
1831.	January	2·	2,916,680	474,650
	February	3·	5,669,640	2,293,820
	March	1·62	2,623,500	
	April	2·3	488,200	
	May	1·25	156,420	
	June	3·1	114,820	10,500
	July	4·9	....	597,040
	August	4·1	276,960	500,845
	September	4·25	641,200	81,700
	October	2·9	3,120,760	1,427,552
	November	2·5	2,546,800	1,189,890
	December	2·4	3,623,690	1,787,880
	Total rain	34·32	22,178,670	8,363,877
	No. of days (12 hours each) worked		By 80 horse, 236	By 60 horse, 130
1832.	January	1.25	1,855,120	2,337,645
	February	·1	324,200	434,700
	March	2·8	1,765,260	912,695
	April	2·5	715,920	
	May	3·1	1,377,400	347,980
	June	3·1	910,180	
	July	2·3	27,135	
	August	4·25	74,925	
	September	·37	21,735	15,309
	October	3·1	348,685	
	November	3·5	1,721,480	1,135,120
	December	2·5	3,110,260	2,018,235
	Total rain	28·87	12,555,300	7,202,684
	No. of days (12 hours each) worked		By 80-horse, 143½	By 60-horse, 112
1833.	January	1·25	2,213,640	1,394,625
	February	5·15	5,594,980	3,859,425
	March	2·062	2,703,300	1,313,840
	April	3·	2,452,220	1,599,380
	May	·82	169,040	
	June	3·12	380,620	2,500
	July	·3	....	49,100
	August	3·5	12,780	18,020
	September	1·2	159,840	96,480
	October	2·1	394,560	200,480
	November	·75	380,990	124,020
	December	1·7	687,740	70,280
	Total rain	24·952	15,149,710	8,728,150
	No. of days (12 hours each) worked		By 80-horse, 147	By 60-horse, 125
1834.	January	2·25	1,616,530	994,305
	February	·5	473,460	454,060
	March	·5	125,700	81,300
	April	1·	8,940	5,850
	May	·5	9,320	6,420
	June	·9	6,900	4,540
	July	6·25	72,210	
	August	2·1	67,920	
	September	1·25	....	46,080
	October	1·	18,640	40,320
	November	1·25	18,570	11,060
	December	·6	10,200	6,220
	Total rain	18·1	2,428,420	1,650,155
	No. of days (12 hours each) worked		By 80 horse, 25¼	By 60-horse, 25¾
1835.	January	2·	781,080	402,380
	February	1·75	469,120	335,330
	March	2·5	2,093,470	1,365,710
	April	1·5	521,130	329,090
	May	2·2	725,190	454,340
	June	1·6	229,930	117,720
	July	1·4	101,940	71,025
	August	1·2		
	September	3·4	1,000	6,300
	October	4·25	723,080	496,470
	November	1·8	1,851,860	1,200,940
	December	·6	1,133,380	747,490
	Total rain	21·2	8,631,180	5,526,795
	No. of days (12 hours each) worked		By 80-horse, 97¼	By 60-horse, 95¾

REVIEWS.

Eastbury, illustrated by Elevations, Plans, Sections, Views, &c. By THOMAS HUTCHINGS CLARKE. Large 4to. 16 Plates.

WHILE we are inclined to withhold from the mansion here described the epithet "magnificent," bestowed upon it in the title-page itself to the volume, which title has been above abridged by us, we do not, therefore, consider it unworthy of the study Mr. Clarke has devoted to it. On the contrary, we are of opinion that he has performed a laudable task in restoring the building in the drawings he has made of it, and thus preserving a specimen of our ancient domestic architecture, historically interesting and curious, although in itself not one which we ourselves should recommend for direct imitation at the present day; since it belongs to that transition period, when the Tudor style had lost much of its better character, and was gradually sinking down into Elizabethan, and the still more degenerate taste that was in vogue in the time of James.

The elevations are for the most part marked by a heavy formality, and also by monotony; their windows being alike both as to design and dimensions, and similarly disposed throughout on every floor; such, at least, is the case with the east and west sides, which have, moreover, no breaks whatever to give any variety or relief to the flatness of their general aspect. The apertures, again, are so numerous and so large, as to give to the house the appearance of being nearly all windows, too much exposed to cold in winter, and to the sun in summer. The want of variety attending the windows is still further increased by the hood-mouldings of their labellings being continued from one to the other, so that those on each floor are connected

together. In this respect the north, or principal front, is less objectionable; the centre portion being recessed, and the windows above the porch, which comes between that part and one of the extremities, being narrower than the others. Of decoration there is very little, except the pinnacles to the gables, and the shafts of the chimneys. By far the most piquant and picturesque aspect the building presents is that on its south side, where it forms a small court, enclosed by a screen wall, the height of the lower floor, and having at its inner angles octagonal staircase towers rising above the roof, with an extensive and very bold stack of chimneys between them, with others on the sides of the court.

In addition to the other plates, there are two coloured ones, showing the side of a room over the hall painted in fresco, and two compartments of a gallery similarly decorated, or, we ought to say, disfigured, for it is hardly possible to conceive anything in more preposterous taste. It is, indeed, so preposterous, so *outré*, and so truly frightful, that we may spare ourselves the trouble of protesting against it, being fully convinced there is no danger whatever of its finding any imitators, even among the most bigoted admirers of the fantastical mode of embellishment which prevailed during the times of Elizabeth and her successor. By no means, however, do we wish to be understood as censuring Mr. Clarke for introducing these curious specimens: rather do they add to the historical value of his publication, by furnishing a record of the taste of the age to which they belong; and if we seem to have been very sparing of commendation in the course of our remarks, it is because the subject itself belongs to a style we cannot advocate, as we are far from admiring it.

We suspect that Mr. C. chose his present subject in compliance rather with the present demand for specimens of the Elizabethan period, than with his own taste. At any rate, it gives us pleasure to find that he has since directed his attention to something better deserving it, namely, the Collegiate Church of Southwell, in Nottinghamshire, of which he has announced a series of engravings, comprising sections and details, to be published early in the present year, of this church. The nave and transepts are Norman, but the rest is chiefly early English, in which respect Rickman praises it as being one of the best examples in the kingdom. "The chapter-house," he further observes, "is a fine specimen of early decorated work: the tracery of the windows, the stalls under them, and the entrance door, which is double, are all very good The organ-screen and some inferior stalls are of later decorated character, and are peculiarly beautiful. The whole of this church deserves the study due to a cathedral, and though it is not so varied in its styles as some edifices, it claims attention for its purity and good preservation."

The Grand Junction Railway Companion. By Arthur Freeling. Liverpool: Henry Lacey. 1837.

This is a very useful little work, which should be in the hands of every person previously to travelling on the Grand Junction Railway—it describes the route of the line, the engineering works, the distances, and all places worthy of notice in the neighbourhood; it also gives a description of the different conveyances and times of starting at each of the termini; likewise the public buildings and places of amusement.

Irish Collegiate Architecture; with Observations on Architecture in General. By Henry Fulton, Esq. Second Edit. Dublin, 1837.

So very rarely does anything concerning architecture, even though limited to mere intelligence, come from the sister island, that even this pamphlet, small as it is, claims more notice than it might otherwise obtain from us. The title indeed is rather a misnomer, the subject being not collegiate architecture, but a building for a museum and lecture-rooms in the court of Trinity College, Dublin; for which, it seems—for we have never chanced to hear anything of the matter before—architects "from all parts of the world" were invited to send in plans by the 1st of March, 1834, premiums of £70, £40, and £30 being offered for the three best. The writer himself, though only an amateur architect, thought fit on this occasion to submit a design, of which the following is his own account:—

"One of my plans was to erect a classical temple, somewhat in the centre of the Library square, having a Corinthian portico of six disengaged columns facing the grand entrance from College Green, and harmonizing in effect with the fronts of the Chapel and Examination-hall; an imaginary line drawn from the east angle of the west (!) flank of the Library would just clear the front of the temple. From this to the centre point, midway between the doors of the Chapel and Examination-hall, the distance would be 159 ft. 6 in., which is just half the distance of the same line to the College Green entrance. This building was calculated either for a chapel, an examination hall, or lecture-rooms, and exteriorly had some resemblance to, but was not a copy of, the Maison Carrée at Nismes, a model of which was at the same time exhibited."

We omit the rest of the description, which, we are informed, was written in order that readers might compare it with the works now in progress, and doubtless with the view of convincing them that the adopted plan is decidedly inferior to it. We further learn, that there were twenty-three competitors, four of whom were Scotch, two English, and the rest all Irish; also, that the cost was limited to £20,000; yet the estimates varied from £43,000 to £19,000, while some designs had no estimates accompanying them; and of the successful candidates, one subsequently gave in his estimate at £80,000, the other at £38,000. Yet as to what the actual design is, and who the architect employed to carry it into execution, we are left entirely in the dark; all that we can gather from the very confused account here given of the business being, that the first premium was awarded to a Mr. Paine, who, on being required by the Provost to make some alterations in his designs, made also a charge for them which was resisted by the College, till an action being instituted against them, they thought fit to compromise the matter by paying £650! After that, an English architect who had not been a candidate, and whose name is not mentioned, was employed; but he too was dismissed for some one else, whose name the writer has not divulged. All this is certainly a very strange business; but instead of stating it as clearly and explicitly as possible, Mr. Fulton has so mystified it by inuendo, and obscure "round-about-way" remarks, that we cannot make out more than his general drift, namely, that there has been strange mismanagement and blundering throughout the whole business, and the building will be very ill adapted to its situation.

Not knowing the precise *locale*, either in regard to space or the arrangement of the surrounding buildings, we are at a loss to comprehend many of the remarks relative to the situation, although to persons acquainted with it they may be intelligible enough; and instead of being "*bothered*" by the author's attempt at explanation, we, and others in our predicament, might have understood it too, had he given in a small wood-cut, a sketch block-plan of the site and relative situation of the adjacent edifices. What adds not a little to the botheration we complain of is, to find him, after speaking of "the works now in progress" in College-court, saying, that that site has been abandoned, and for no other reason, it would seem, than because he had fixed upon it; and that it is now "projected to make an extended square, of which the library range will form half a side; where, perhaps, we are to have a prison-like edifice in the middle, with a beehive on the top, and the portico of the Roman Pantheon stuck on the centre of its front." Are we to understand by this, that everything has been begun *de novo*, or rather is entirely "at sixes and sevens," and nothing as yet—at least at the time the pamphlet was written—definitively settled upon? We give up the point in despair. The truth is, the writer is a very bad hand at mere matter-of-fact; let us therefore see, whether he be much better in regard to matters of opinion, as he has subjoined "a few remarks on architecture in general," a subject which, he says, he greatly desires to see more studied by his countrymen.

These remarks amount to no more than a mere confession of faith on his part; which leaves no room for suspecting him of being infected with the Gothic heresy when we read, that after the decadence of the art in the age of Diocletian, "then every order, every principle of architecture, was violated and thrown into confusion; every expedient exhausted for the purpose of producing novelty; and strange to say, out of this chaos there arose a style—although eminently characteristic of those violations, charged with meretricious ornament without limit, regardless of all order, trifling and weak in detail, yet magnificent and bold in the aggregate. Such is the style called Gothic—a barbarous term better exchanged for that of Diocletian, out of which it sprung, and to which it bears more resemblance, even with the acquisition of the pointed arch and clustered column, than the Palladian does to the Greek style." This passage throws some new light on the subject, because it shows that we have all along been blundering in calling the style alluded to Gothic, when it should in reality be termed Diocletian; but it is a light that will strike Welby Pugin as a *coup de soleil*, should he ever chance to light upon the book. "Charged with meretricious ornament—trifling and weak in detail!"—for those scandalous expressions Mr. Fulton ought to expect nothing short of immolation from Pugin the pugnacious, the very next time he takes pen in hand; from

"the Goth,
Whose rage for the Gothic is such that it fairly amounts unto wrath."

Neither do we think that John Britton will be much better pleased when he finds that his term Christian architecture, which he flatters himself he has brought into vogue, is now to be exploded, and to make way for the horribly heathenish one of "Diocletian." As for ourselves, why we could forgive him much more, and give him a hearty bravo to boot, in return for the thrust he has directed against that arch-

heresy of all, the Palladian style. He further on declares the Saxon and Tudor styles—which are by-the-by tolerably wide apart from each—and their varieties, to be more commendable than that now called Palladian; for entertaining which opinion it will be well if he escapes without a flagellation from Joseph Gwilt, the sworn champion of Palladianism, and the bitter foe of all amateurs.

Afterwards, we admit, he puzzles us not a little when he says: "As to the erection of public buildings, unfortunately, modern architects, too vain of their own resources, draw little from the treasures the ancients have left us, except a column or a moulding." How they manage matters just now on the other side of the Irish Channel we know not; but we do know that, here at home, it is impossible to accuse our architects of relying too much on their own resources, since for public buildings they rarely do more than help themselves by wholesale to the "treasures of the ancients," as far as they can be made to answer their purpose, without having recourse to their own stock of ideas, unless when their drafts upon the common treasury are returned dishonoured. The writer objects—and so do we—to super-columniation; not, however, on critical grounds, but for the following whimsical reasons—"columns are supposed to represent trees, and cannot with propriety be placed on the top of one another." Where he picked up the notion that columns represent trees we know not; it is an odd idea, pretty near akin to that of old Serlio, if we mistake not, when he compares a chimney to the nose on a man's face. For our part, we have always taken columns to be neither more nor less than columns. Why are columns like trees? would be a more puzzling conundrum than, "Why is the roof of a house like the sun?"—since to that question every child can reply, "Because it has *beams*." And now, having arrived at this very sunny and luminous point in our lucubrations, we may as well vanish like a flash of "the brisk lightning."

Companion to the Almanack, or Year-Book for 1838. London. Knight and Co.

For a series of years this publication has distinguished itself by giving, under the section of "Public Improvements," an historical *précis* and description of the principal buildings erected or commenced within the preceding twelvemonth, so as to form an exceedingly useful and valuable record in regard to the progress of architecture; and, we have no doubt, is so well known as such to most of our readers, as scarcely to require our recommendation. The present volume is, in this respect, quite equal to any of its predecessors; much superior, in fact, to the earlier ones, and contains some ably written descriptions, with not a few exceedingly clever remarks. The fullest accounts are those of the interior of the College of Surgeons, and the Fitzwilliam Museum. There is likewise a very satisfactory one of the Leicester General Newsroom and Library, lately erected from the designs of Mr. W. Flint. Of this subject there is a wood-cut. The other illustrations are the portico of the National Gallery—the principal Front of the Fitzwilliam Museum—the Medical Institution at Liverpool—the Arch before the New Palace—the Oxford and Cambridge Club House—a Plan of the Corn Market and Grey Street, Newcastle—and the Entrance to St. Mary's Cemetery, Liverpool. The idea of showing the portico only of the National Gallery, and the parts immediately adjoining it, appears to us a very excellent one, as that feature is thereby exhibited more distinctly than it would be in a view of very large dimensions, and without more than just the lower portion of the dome being seen, which, though the portico itself is the best, happens, unfortunately, to be the most censurable feature in the whole design.

We are of opinion it would very well answer the publishers' purpose were they now to reprint all the architectural portions of the series, as far as it has proceeded, in a separate pocket volume, with an enlargement of some of the descriptions, and some additional cuts. Such a reprint would not at all interfere with the "Companion" itself; on the contrary, many, we apprehend, would be glad to have all the architectural chapters in a collective and separate form, even though they might happen to have the whole of the "Companion to the Almanack."

The Millwright and Engineer's Pocket Director. By John Bennett, Engineer, &c.

This is a little work containing the prices of machinery and other articles connected with millwork, machinery, engines, &c., together with calculations of the weight of iron, copper, and other metals, and a few useful diagrams, showing how the square, the circle, triangle, and other geometrical figures may be subdivided into proportional parts. The prices, in general, are too high; if they were revised, the work would be very useful to the younger members of the profession.

LITERARY NOTICES.

Dr. Ure has for a considerable period been engaged on "A Dictionary of Arts, Manufactures, and Mining," which is now in the press, and will form one very thick volume, 8vo., illustrated by a large number of engravings on wood, and is intended as a companion to Mr. M'Culloch's "Dictionary of Commerce and Commercial Navigation."

Dr. Arnott, whose "Elements of Physics" have been so eminently popular, has just ready for publication a work "On Warming and Ventilating, with Directions for making and using his Thermometer Stove, or Self-regulating Fire, and other New Apparatus," which he has lately invented.

Mr. Wood's valuable work on "Railroads," which has so long been out of print, will shortly re-appear. The new edition is now in the press. It has been thoroughly revised and corrected, and much enlarged; with an entirely new set of plates and woodcuts.

Mr. John Howard Kyan, Patentee of the Anti-Dryrot Composition, is about to publish a work "On the Elements of Light, and their Identity with those of Matter, Radiant and Fixed."

Mr. H. Lacey is about to publish, in a pocket volume, under the sanction of the Company, "A London and Birmingham Railway Companion," on the plan of, and by the same Author as "Freeling's Grand Junction Railway Companion."

Mr. Williams is preparing for publication a valuable work "On Bridges," which, we are happy to hear, is to be edited by Mr. Macneill, C.E., &c.

An Elementary Course of CIVIL ENGINEERING. *By* D. H. Mahan, *Professor of Military and Civil Engineering in the United States' Military Academy.**

The general series of operations preliminary to establishing a line of internal communication, whether it be a road, a canal, or a railroad, is the same in all cases, and consists, in the first place, of a *reconnaissance*, or examination of the country between the two points to be connected by the line, for the purpose of ascertaining the most favourable direction pointed out by the natural features of the country; and, in the second place, of an accurate survey of the various lines which have been fixed upon by the reconnaissance, in order to compare their relative advantages.

Reconnaissance.—In taking into view any considerable extent of country, two remarkable features immediately present themselves, which are the valleys of the water-courses, and the high grounds by which these valleys are separated. Each of these features would seem, at first sight, to present an endless variety of forms and combinations; but, upon more careful inspection, it will be found, that the more considerable valleys are the main channels, or drains, for others of a secondary character, whilst these, in their turn, perform the same functions for others of a still smaller class, and so on, in the descending order of progression, from those immense basins which receive the waters of the largest rivers, to the scarcely distinguishable furrows of the most trifling rills. A similar order of progression will be found to hold with respect to the high grounds, in descending, by successive degrees, from those lofty chains which separate valleys of the first order, to the spurs which, proceeding from their sides, divide the secondary valleys, and throw out in their turn others of an inferior order, which separate the tributaries of the secondary valleys, and are themselves the main stems of a still inferior order.

Two remarkable classes of lines present themselves in connexion with these natural features; they are the water-courses, which form the lowest lines of the valleys; and the dividing ridges, which are the highest lines of the main chains and spurs; and each of these classes possess the remarkable properties of being lines of greatest declivity of the surfaces to which they belong.

From this glance at the general configuration of any portion of the earth's surface, it will readily appear, that lines of communication admit of a division into two classes: 1. Those which connect two points of the same valley; 2. Those which connect two points separated by a dividing ridge. And as one of the principal conditions which every line of communication should satisfy is to connect the two points by the shortest practicable route, it will also readily appear from what has been said, that this condition will be satisfied for the first class of communications, by following a direct line between the two points, since the level between the two does not admit of reduction; whereas, in the second class, the line must not only be as direct as practicable between the two points, but must also pass the dividing ridge at the lowest level between them, in order to effect all possible reduction in the height between the two points and that in which the line crosses the ridge.

It is, therefore, a subject of importance to be able, by a simple reconnaissance, to ascertain the lowest point of a dividing ridge between any two points, since it will abridge the labour of the succeeding operations.

In the common maps of every portion of a country, it will be found that the water-courses are usually laid down with sufficient accuracy to shew the direction in which the valleys lie; that of the rising grounds by which they are separated, and even the approximate position of the ridges. With these approximate data the engineer is furnished with a guide to direct him to the points which present the greatest probability of a favourable result. For there exists a necessary co-relation between the water-courses and ridges, as the lines of greatest declivity of the surfaces to which they belong, from which the highest and lowest points of those surfaces can be readily determined. A few familiar illustrations will serve to place this in a clear point of view,

* Published at New York by Wiley and Putnam.

without entering into the strictly mathematical reasoning upon which it rests.

From the physical facts of water always seeking what is commonly termed its lowest level, and that by the shortest line, or the line of greatest declivity of the surface along which it flows, it follows, that the water-courses mark out the lowest points of the valleys, and are also their lowest lines of greatest declivity. If, then, on a map of any portion of a country, it be found that the water-courses all diverge from, or converge towards one point, it will indicate, without farther examination, that this point is in the first supposition the highest, and, in the second, the lowest point of that portion of country.

If two water-courses flow in opposite directions from a point, it will indicate that this is the lowest point of the ridge of the rising ground by which their valleys are separated; for, from what has just been laid down, the ridge must evidently decline on both sides to this point.

If two water-courses flow in the same direction and parallel to each other, it will simply indicate a general inclination of the ridge between them, in the same direction as that of the water-courses. The ridge, however, may present in its course elevations and depressions, which will be indicated by the points in which the water-courses of the secondary valleys, on each side of it, intersect each other on it; and these will be the lowest points at which lines of communication, through the secondary valleys, connecting the main water courses, would cross the dividing ridge.

If two water-courses flow in the same direction, and parallel to each other, and then at a certain point assume divergent directions, it will indicate that this is the lowest point of the ridge between them.

If two water-courses flow in parallel but opposite directions, there is nothing to indicate the direction of the inclination of the ridge between them, if any exists; but the meeting of the water-courses of the secondary valleys on the ridge, or an approach towards each other at any point of the two principal water-courses, will indicate the points of depression in the ridge.

Survey.—The surveys which succeed the reconnaissance consist of several *trial lines* between the points, fixed upon in the reconnaissance, which are generally run with the chain and compass, and are then levelled with the spirit level throughout their entire extent, for the purpose of determining the undulations of the ground along the lines. Besides the longitudinal levels, a series of cross levels are made, at equal distances apart, perpendicular to the directions of the trial lines, in order to show the inclination of the ground, on each side of the trial lines, for a width greater than that which the line of communication will probably occupy.

Map and Report.—After these surveys are made with all desirable accuracy, a map, exhibiting the topographical features of the ground, and the profiles in the direction of the different levels, is carefully drawn up from the notes taken on the ground. As there are many other points, upon which accurate information is desirable in such cases, that cannot be shown on the map, it should be accompanied by a descriptive report, in which should be set forth the character of the natural features of the country along the lines which are deemed favourable or otherwise to the construction of the road, as the nature of the soil, that of the water-courses, &c. &c.

Survey for a Road.—In laying out a common road, the engineer is less restricted in the direction of his line than in any other kind of communication, owing to the character of the conveyance used upon it; nevertheless he should confine himself, as far as economy of expenditure will permit, to the most direct line between the two points, and the one which offers the least height to be overcome. The obstacles with which he will meet to prevent this are hills, valleys, marshes, and water-courses.

When a hill intervenes between the two points to be connected, the principal object to be attended to, is to give the road such a slope, that in the descent with the usual speed there shall be no danger to the carriages from the accelerating force of gravity in the direction of the road; and this will be accomplished by not making the slope greater than what is termed *the angle of friction* for the particular kind of a road covering used, whether it be a pavement, a broken stone surface, or a gravel road. For when the slope of the road is equal to the angle of friction, the friction of the carriage wheels will be in equilibrium with the component of the force of gravity in the direction of the road, and this component will, therefore, have no tendency to increase the velocity of the carriage, which it would do were it greater than the force of friction, as the difference between the two forces would then act as an accelerating force on the carriage.

To determine the angle of friction, direct experiments have been made, by allowing carriages to descend freely on a road of variable inclination until the friction overcame the force which caused the motion; and also by the *force of traction* on a level road, or the fractional part of the weight of the carriage which, when applied to it, would be just sufficient to overcome the friction and set the carriage in motion.

The following are the results of those experiments, the load moved being one ton, or 2240 pounds.

No. 1.	Well made pavement	33 lbs.
2.	Broken stone surface laid on an old flint road . .	65 „
3.	Gravel road	147 „
4.	Broken stone surface on a rough pavement bottom .	46 „
5.	Broken stone surface on a bottom of beton . . .	46 „
6.	Railways	8 „

From this it appears that the angle of friction, in the first case, is represented by $\frac{33}{2240}$, or $\frac{1}{68}$ nearly; and that the slope of the road should therefore not be greater than one perpendicular to sixty-eight in length, or that the height to be overcome must not be greater than one sixty-eighth of the distance between the two points measured along the road, in order that the force of friction may counteract that of gravity in the direction of the road.

A similar calculation will show that the angle of friction, in the other cases, will be as follows:—

No. 2.	1 to	35 nearly.
3.	1 „	15 „
4 and 5 . . .	1 „	49 „
6.	1 „	280 „

In laying out, therefore, a road, when one point is higher than another, or when it is necessary to pass a ridge at a point higher than either of the extreme points, the line followed should be direct between the two points, so long as the ascent is within the foregoing limits, according to the character of the road covering, and no other obstacles intervene which would render necessary a change of direction. If, owing to any of these causes, a change of direction should become necessary at any point, it will be made, and be continued in the new direction until the direction towards the point of arrival can be resumed. An examination of the line, between the point where the original direction is resumed, and the first point, will remain to be considered in comparison with those already laid out.

In all cases, so far as it can be done with a due regard to economy in the outlay of construction, a uniform ascent should be obtained between the points of departure and arrival, to avoid useless ascents and descents, which occasion a loss of power. Cases of this character not unfrequently present themselves; as for example, where the points of departure and arrival, lying on opposite sides of a hill, can be connected by a straight line by crossing the ridge at a level higher than either of the points; or else by taking a circuitous direction around the base, by which the ascent between the two would be made uniform. In such cases the choice of the engineer must be governed by his judgment, founded on a comparison of the expense of the two lines, and the advantages which they severally offer with respect to the time and means of conveyance.

A uniform ascent within the prescribed limits can always be obtained, whenever there is a continual rise of the ground between the point of departure and the point where the road crosses the ridge, by making frequent changes of direction in a zigzag line between the two points. The length of each zigzag will depend on the nature of the surface, and will in no manner affect the total length of the road if the ascent be uniform; for it is a property of lines of the same inclination which connect two different levels to be of the same length, whatever change of direction the lines may assume.

It may be stated in this place, that the straight portions of the line are connected at the points of change of direction by an arc of a circle tangent to the two lines which it connects. This curved part should not be so abrupt as to require any considerable diminution of speed in the carriage whilst passing over it, and, as a farther precaution for safety in descents, the slope of the road at these points should be less than along the straight portions of the line.

When a valley intervenes between the two points, the same principles should guide the engineer in the choice of his line as in the case of a hill; for the valley must be descended on the side towards the point of departure to be ascended on the opposite side; and the ascent and descent should be as uniform as practicable, and in no part greater than the limits already laid down.

The case may also here present itself, whether it will be best to pursue the direct line between the two points, or to deviate from it, by crossing the valley at a higher level nearer the head of it, by a more circuitous line. Other cases may present themselves where the width of the valley, being much less at some lower level, might offer a great economy in the embankments; or, finally, where undulations in the ground, if taken advantage of, would produce the same effect, by cutting down a portion of the elevated parts to fill up the depressions between them. All of these cases require careful examination before any line between the points is definitively adopted.

When a marshy or very wet soil intervenes between the points, it will generally be best to change the direction of the line to avoid crossing it, owing to the difficulty of obtaining a firm bottoming for the road covering in such localities, which can only be effected by a thorough system of drainage.

When a water-course intervenes between the points, the point at which the line should intersect it will depend on the character of the stream, and that of the approaches to it; as both economy of construction, and safety to the structure over which the road is carried, may designate some other point than that in which the direct line intersects the water-course.

As the general direction of a road will usually be the same as the valleys of the water-courses between the points of departure and arrival, the advantages presented by both sides of the valley for constructing the road should be carefully balanced. The principal favourable points are few secondary water-courses intersecting the line of the road, a firm soil, a free exposure of the road surface to the action of the sun and wind, and facilities for procuring the necessary materials to form the road covering.

A careful comparison of the surveys of the different trial lines will usually enable the engineer to decide, without farther labour, upon the one which combines the most desirable advantages.

Equalizing the Excavations and Embankments, &c.—The next important point to be adjusted is *balancing*, or *equalizing* the excavations and embankments; that is, to make such a disposition of the slopes, and such partial changes in the main direction of the line, that the parts which will require to be excavated shall furnish just sufficient earth to form those portions which must be filled in. The solution of this problem, in the cases which most usually occur in practice, is of a very indeterminate character, and the engineer is obliged to resort to a system of successive approximations, by assuming different slopes within the prescribed limits, and by shifting the position of the line to the right or left, until he arrives at the most favourable

result. In conducting these trials, the whole line should be subdivided into several portions, and the equalization of these portions should be attempted independently of each other, instead of trying a general equalization throughout the entire line.

In balancing the excavations and embankments, their solid contents are calculated, by subdividing them into the most simple geometrical solids, such as prisms, prismoids, wedges, and pyramids, whose solidities can be determined by the ordinary rules for the mensuration of solids. This subdivision will present but little difficulty when a sufficient number of cross profiles have been taken. Each cross profile will present a quadrilateral, or a triangular figure, of which the line of the roadway, the side slopes, and the line of the surface of the ground, will form the sides. The three first will be right lines, and the last a curved line, but generally of such slight curvature that it may be regarded as a right line. The same remark may be made with respect to the surface of the ground, which, although in fact a curved surface, may be regarded as a plane surface, between any two of the consecutive planes of the profiles, provided these profiles be not taken too far apart. This manner of regarding the surface of the ground, will only give an approximate result in calculating the contents of the solids; but this approximation will be sufficiently accurate for all practical purposes, and will avoid more complicated methods, which, although more rigorous in their results, are less suited to the solution of problems of this nature.

In determining the relations between the volumes of the embankments, and the excavations by which they are to be furnished, it must also be borne in mind, that earth in its natural state occupies less space than when broken up; and as the embankments when first formed are in the state of earth newly broken up, an allowance must be made according to the nature of the soil. This allowance will generally vary between one twelfth and one eighth; that is, earth when first broken up will occupy from one twelfth to one eighth more bulk than it does in its natural state.

After the excavations and embankments are equalized, the changes caused by the operation in the *direction of the line* are laid down on the map previously to lying out the line on the ground. This operation is performed by running the new line as laid down on the map, and marking the middle line, or *axis* of the road, by stakes or pickets, placed at equal intervals apart, and numbered to correspond with the same points on the map. The width of the roadway, and the lines on the ground, corresponding to the side slopes of the excavations and embankments, are laid out in a similar manner by stakes, placed along the lines of the cross profiles.

Besides the numbers marked on the stakes to indicate their position on the map, other numbers, showing the depth of the excavations, or the height of the embankment from the surface of the ground, accompanied by the letters *Cut. Fill.* to indicate a *cutting* or a *filling*, as the case may be, are also added, to guide the workmen in their operations. The positions of the stakes on the ground, which show the principal points of the axis of the road, should, moreover, be laid down on the map with great accuracy, by ascertaining their bearings and distances from any fixed and marked objects in their vicinity, in order that the points may be readily found, should the stakes be subsequently misplaced.

Detailed maps of the different divisions of the road, made to a suitable scale, should accompany the general map. The object of these maps being to give, with the utmost accuracy, the longitudinal and cross sections of the natural ground and the road way, by exhibiting all the parts of the road surface, and of the excavations and embankments, with the horizontal dimensions of all the parts, and the vertical heights of the different points above one general plane of level, termed the *plane of comparison*, numbered with great care.

Detailed drawings of the road covering, of the masonry and carpentry of the bridges, culverts, &c., to which are added written *specifications* of the manner in which the embankments, excavations, masonry, &c., is to be executed, should accompany the division maps, to guide the superintending engineer of the division in the performance of his duties.

Before breaking ground, to commence the *grading*, or forming the excavations and embankments, another problem of a very intricate character, which has occupied the attention of the first mathematicians, and has called into play all the resources of the higher analysis, remains to be solved. This is the removal, and the disposition of the different volumes so as to present the greatest economy in transportation and expense. The results which have been arrived at in the different cases which have been treated, seldom present themselves in practical operations. There is, however, one general principle which is applicable to all cases, which is, that to make the transportation a minimum between the points from which the earth is taken, and that where it is deposited, the lines passed over by the centre of gravity of all the particles must neither cross each other in a horizontal, nor in a vertical direction. To apply this principle to practice, the entire volumes of the embankments and excavations should be subdivided into several others, by planes in the direction of the transportation, and these partial solids should be removed within the boundaries marked out by these planes. The farther the subdivision is carried, the greater will be the accuracy of the result.

Grading.—In forming the excavations, the inclination of the side slopes demand peculiar attention. This inclination will depend on the nature of the soil, and the action of the atmosphere and internal moisture upon it. In common soils, as ordinary garden earth, formed of a mixture of clay and sand, compact clay and compact stony soils, although the side slopes would withstand very well the effects of the weather with a greater inclination, it is best to give them two base to one perpendicular, as the surface of the roadway will, by this arrangement, be well exposed to the action of the sun and air, which will cause a rapid evaporation of the moisture on the surface. Pure sand and gravel may require a greater slope according to circumstances. It is not usual to use any artificial means to protect the surface of the side slopes from the action of the weather; but it is a precaution which, in the end, will save much labour and expense in keeping the roadway in good order. The simplest means which can be used for this purpose, consist in covering the slopes with good sods, as shown in fig. 1, or else with a layer of vegetable mould about four inches thick, carefully laid and sown with grass seed. These means will be amply sufficient to protect the side slopes from injury when they are not exposed to any other causes of deterioration than the wash of the rain, and the action of frost on the ordinary moisture retained by the soil.

Fig. 1.

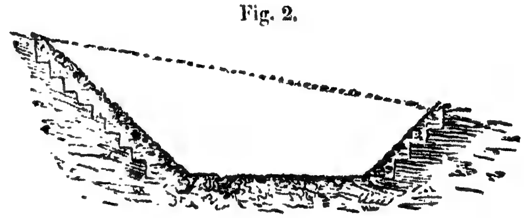
When the side slopes are not protected in this manner, it will be well, in localities where stone is plentiful, to raise a small wall of dry stone at the foot of the slopes, to prevent the wash of the slopes from being carried into the roadway.

A covering of brush-wood, or a thatch of straw, may also be used with good effect; but, from their perishable nature, they will require frequent renewal and repairs.

In excavations through solid rock, which does not disintegrate on exposure to the atmosphere, the side slopes might be made perpendicular; but as this would exclude in a great degree the action of the sun and air, which is essential to keeping the road surface dry and in good order, it will be necessary to make the side slopes with an inclination, varying from one base to one perpendicular, to one base to two perpendiculars, or even greater, according to the locality; the inclination of the slope on the south side in northern latitudes being greatest, to expose better the road surface to the sun's rays.

The slaty rocks generally decompose rapidly on the surface when exposed to moisture and the action of the frost. The side slopes in rocks of this character may be cut into steps, as shown in fig. 2, and then be covered by a layer of vegetable mould sown in grass seed, or else the earth may be sodded in the usual way.

Fig. 2.

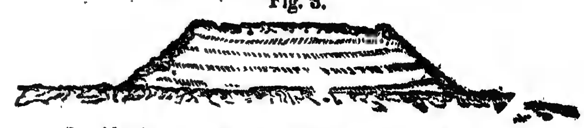


The stratified soils and rocks, in which the strata have a *dip*, or inclination to the horizon, are liable to *slips*, or to give way by one stratum becoming detached and sliding on another, which is caused either from the action of frost, or from the pressure of water, which insinuates itself between the strata. The worst soils of this character are those formed of alternate strata of clay and sand, particularly if the clay be of a nature to become semi-fluid when mixed with water. The best preventives that can be resorted to in these cases, are of adopt a thorough system of drainage, to prevent the surface water of the ground from running down the side slopes, and to cut off all springs, which run towards the roadway from the side slopes. The surface water may be cut off by means of a ditch (fig. 1) made on the up-hill side of the road, to catch the water before it reaches the slope of the excavation, and convey it off to the natural water-courses most convenient, as in almost every case it will be found that the side slope on the down-hill side is, comparatively speaking, but slightly affected by the surface water. To cut off the springs, it will be necessary to sink a ditch, or drain, on the side of the road from which the water flows, sufficiently deep to intercept the springs, and to fill this drain with broken stone loosely thrown in, to offer an easy water way, and to prevent the drain from filling in with earth. The drain, thus arranged, must have an outlet towards some natural water-course.

Neither of these precautions, however, will suffice in some cases where the soil is very loose, or is of a marly or chalky character: and all that can be done will be to give the wash a wide berth, and to allow the side slopes to assume with time their natural inclination, removing the fragments of the slips as they are deposited at the foot of the slope, except such as may form a kind of buttress for the slopes.

In forming the embankments, as shown in fig. 3, the side slopes should be made with a less inclination than that which the earth naturally assumes, for the purpose of giving them greater durability, and to prevent the width of the top surface, along which the roadway is made, from diminishing by every change in the side slopes, as it would were they made with the natural slope.

Fig. 3.



To protect the side slopes more effectually, they should be sodded or sown in

grass seed, and the surface water of the top should not be allowed to run down them, as it would soon wash them into gullies, and destroy the embankment. In localities where stone is plenty, a sustaining wall of dry stone may be advantageously substituted for the side slopes.

To prevent, as far as practicable, the settling which takes place in embankments, they should be formed with great care; the earth being laid in successive layers of about four feet in thickness, and each layer well settled with beetles. As this method is very expensive, it is seldom resorted to, except in works which require great care, and are of trifling extent. For extensive works, the method usually followed, on account of economy, is to embank out from one end, carrying forward the work on a level with the top surface. In this case, as there must be a want of compactness in the mass, it would be best to form the outsides of the embankment first, and to gradually fill in towards the centre, in order that the earth may arrange itself in layers with a dip from the sides inwards; this will in a great measure counteract any tendency to slips outwards.

A common method also, but a very bad one, is to make what is termed a *side forming*, which is done by raising the whole embankment at once, commencing at one side and filling towards the other. This method is only used when the road is partly in cutting and partly in filling; it is unstable, and the earth settles greatly and is liable to slips.

Besides the necessary embankments for the road surface, there are others termed *spoil banks*, which consist of the surplus earth from excavations that is deposited in some convenient locality as near to the point from which the earth is taken as safety to the side slopes of the excavation will permit. The spoil banks are generally formed parallel to the roadway, and some feet back from the top of the side slopes, to prevent the weight of the mass from crushing in the side slope. The down-hill side will, in most cases, be the most suitable locality; and, if it be thought necessary, a slight surface drain may be placed at the foot of the slope, towards the road, to prevent the water from the spoil bank from making its way to the side slope of the excavation.

In the cases of what are termed *side cuttings*, where the roadway is partly in excavation and partly embankment, the formation of the side slopes and excavations and embankments, with the precautions to preserve them from damage, will be arranged as has already been explained. But if the inclination of the natural surface of the ground on which the embankment rests is so great as to endanger its stability, it will be necessary to form the surface into steps, as shown in fig. 4, to give the embankment a stable bed.

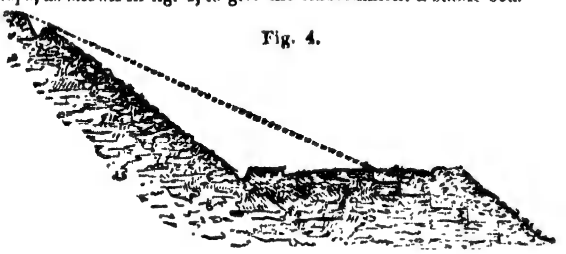
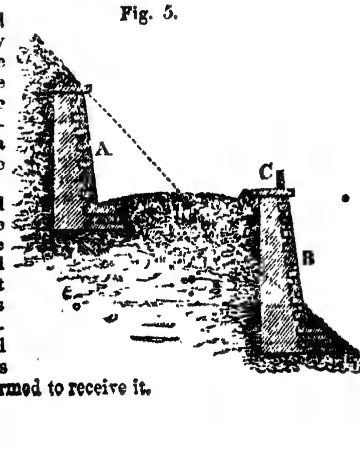


Fig. 4.

In side cuttings along a natural surface of great inclination, the method of construction just explained will not be sufficiently secure, and sustaining walls must be substituted for the side slopes, as shown in fig. 5, both of the excavations and embankments. These walls may be made simply of dry stone, when the stone can be procured in blocks of sufficient size to render this kind of construction of sufficient stability to resist the pressure of the earth. But when the blocks of stone do not offer this security, they must be laid in mortar, and hydraulic mortar is the only kind which will form a safe construction. The batter of the walls may vary between twenty-four perpendicular to one base, and six perpendicular to one base. It should never be less than this latter, otherwise the mortar between the joints near the surface will be washed out by the rain, and the seeds of vegetables lodging in the voids will germinate, and in a short time destroy the adhesion between the mortar and stone by the penetration of their roots between them. The wall A which supplies the slope of the excavation should be carried up as high as the natural surface of the ground; the one B that sustains the embankment, should be built up to the surface of the roadway; and another wall C, of less thickness and about four feet high, termed a *parapet wall*, should be raised upon it to secure vehicles from accidents in passing from the line of the roadway.

Fig. 5.



A road may be constructed partly in excavation and partly embankment along a rocky ledge by blasting the rock, when the inclination of the natural surface is not greater than one perpendicular to two base; but with a greater inclination than this, the whole should be in excavation.

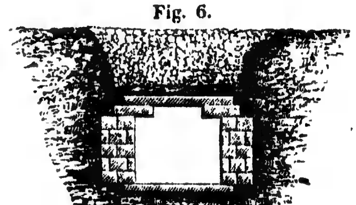
There are examples in road constructions, in localities like the last, supported on a frame work, consisting of horizontal pieces, which are firmly fixed at one end by being let into holes drilled in the rock, and are sustained at the other by an inclined strut underneath, which rests against the rock in a shoulder formed to receive it.

Drainage.—A system of thorough drainage, by which the water that filters through the ground will be cut off from the soil beneath the roadway, to a depth of at least three feet below the bottom of the road covering, and by which that which falls upon the surface will be speedily conveyed off, before it can filter through the road covering, is essential to the good condition of a road.

The surface water is conveyed off by giving the surface of the roadway a slight transverse convexity from the middle to the sides, where the water is received into the gutters, or *side channels*, from which it is conveyed by under-ground aqueducts termed *culverts*, built of stone or brick, and usually arched at top, into the main drains that communicate with the natural courses. This convexity is regulated by making the figure of the profile an ellipse, of which the semi-transverse axis is 15 feet, and the semi-conjugate axis nine inches; thus placing the middle of the roadway nine inches above the bottom of the side channels. This convexity, which is as great as should be given, will not be sufficient in a flat country to keep the road surface dry; and in such localities, if a slight longitudinal slope cannot be given to the road, it should be raised, when practicable, three or four feet above the general level, both on account of conveying off speedily the surface water, and to expose the surface better to the action of the wind.

To convey the water from the subsoil in a level country, ditches termed *open side drains*, are made parallel to the axis of the road, and at some feet from it on each side. The bottom of the side drains should be at least three feet below the road covering; their size will depend on the nature of the soil to be drained. In a cultivated country the side drains should be on the field side of the fences.

Fig. 6.



As open drains would be soon filled up along the parts of a road in excavation by the washings from the side slopes, covered drains, built either of brick or stone, must be substituted for them. These drains (fig. 6) consist simply of a flooring of flagging stone or of brick, with two side walls of rubble, or brick, which support a top covering of flat stones, or of brick, with open joints of about half an inch, to give a free passage way to the water into the drain. The top is covered with a layer of brushwood and clean gravel, or broken stone in small fragments is laid over this, for the purpose of allowing the water to filter freely through to the drain, without carrying with it any earth or sediment which might in time accumulate and choke it. The width and height of covered drains will depend on the materials of which they are built, and the quantity of water to which they yield a passage.

Besides the longitudinal covered drains in cuttings, other drains are made under the roadway which, from their form, are termed *cross mitre drains*. Their plan is in shape like the letter V, the angular point being in the centre of the road, and pointing in the direction of its ascent. The opening of the angle should be so regulated, that the bottom of the drain shall not have a greater slope along either of its branches, than one perpendicular to one hundred base, to preserve the masonry from damage by the current. The construction of mitre drains is the same as the covered longitudinal drains. They should be placed at intervals of about 60 yards from each other.

In some cases surface drains, termed *catch water drains*, are made on the side slopes of cuttings. They are run up obliquely along the surface, and empty directly into the cross drains which convey the water into the natural water-courses.

When the roadway is in side cutting, cross drains of the ordinary form of culverts are made, to convey the water from the side channels and the covered drains into the natural water-courses. They should be of sufficient dimensions to convey off a large volume of water, and to admit a man to pass through them, so that they may be readily cleared out or even repaired without breaking up the roadway over them.

The only drains required for embankments are the ordinary channels of the roadway, with occasional culverts to convey the water from them into the natural water-courses. Great care should be taken to prevent the surface water from running down the side slopes, as they would be soon washed into gullies by it.

Very wet and marshy soils require to be thoroughly drained before the roadway can be made with safety. The best system that can be followed in such cases, is to cut a wide and deep open main drain on each side of the road, to convey the water to the natural water-courses. Covered cross drains should be made at frequent intervals to drain the subsoil of the roadway. They should be sunk as low as will admit of the water running from them into the main drains, by giving a slight slope to the bottom each way from the centre of the road to facilitate its flow.

Independently of the drainage for marshy soils, they will require, when the subsoil is of a spongy elastic nature, an artificial bed for the road covering. This bed may, in some cases, be formed by simply removing the upper stratum to a depth of several feet, and supplying its place with well packed gravel, or any soil of a firm character. In other cases, when the subsoil yields readily to the ordinary pressure that the road surface must bear, a bed of brushwood, from 9 to 18 inches in thickness, must be formed to receive the soil on which the road covering is to rest. The brushwood should be carefully selected from the long straight slender shoots of the branches of undergrowth, and be tied up in bundles termed *fascines*, from 9 to 12 inches in diameter, and from 10 to 20 feet long. The fascines are laid in alternate layers crosswise and lengthwise, and the layers are either connected by

pickets, or else the withes, with which the fascines are bound, are cut to allow the brushwood to form a uniform and compact bed.

This method of securing a good bed for structures on a weak wet soil has been long practised in Holland, and experience has fully tested its excellence.

(*To be continued.*)

Minutes of Proceedings of the Institution of Civil Engineers, containing Abstracts of Papers, and of Conversation for the Session of 1837.

(Continued from Page 79.)

"May 2, 1837.—The President in the Chair.

"The Ordnance Maps of England and Wales were received from the Master-General and Board of Ordnance, and the President announced that, by the munificence of Mrs. Chapman, the Institution was to be made the depository of all the professional plans and papers of the late William Chapman, of Newcastle.

"Mr. Harrison presented a drawing of the Drops at South Shields, erected by himself, and gave an account of the method of working them.

"Some remarks were made on the various methods which had been employed for representing the nature of a country as to levels and slopes. In one map of Warsaw the level of every point was shown; in the Ordnance maps of France the heights of most principal points above the level of the sea are noted. With respect to slopes, different degrees of shading might be used advantageously for mountain ground, the gentle inclinations being lightly and the steep places deeply shaded. In some Prussian maps they had represented mountain ground by circular lines at assigned distances, the lines being very near for considerable slopes. An objection to this plan is, that an engraver aims at a degree of accuracy which he can rarely arrive at; he cannot easily possess sufficient data to put the lines all round a mountain with any tolerable degree of accuracy.

"'*On the Velocity of the Water in Belfast Harbour, by William Bald, Civil Engineer, F.R.S.E., M.R.I.A.*'

"The Bay of Belfast, or Belfast Lough, is about eleven miles long by three broad, and has a depth of water varying from two to eight fathoms at low tide. The bottom consists of mud, and is an excellent holding ground. The mean of thirteen observations assigns the low-water line of spring tides, during the months of January and February last, at *two* feet above the sill of the gate of the new Graving Dock.

"The waters of the river Laggan, fed by a basin whose area is 200 square miles, are discharged into Belfast Bay. The average quantity of rain annually is about 36 inches; *assuming that one third of this falls into the sea by the Laggan river*, the quantity will be equal to *one foot* of depth over the whole basin. The mean daily quantity will be somewhat more than fifteen million cubic feet per day. This is the power combined with the tidal water to keep open the Channel of Belfast.

"On a map accompanying this paper are delineated the velocities of the ascending and descending currents at different states of the tide and parts of the channel.

"Mr. Harrison gave, at the request of the President, some information respecting the fuel and fire-boxes of the locomotives on the Stanhope and Tyne Railway. From long experience they found that coal, which contains much bitumen, causes the tubes of the fire-boxes to leak in a very short time. They obtained coal as free from sulphur as possible, and the consequences had been most advantageous; for during two years and a half not more than 120 tubes had been required for seven engines, of which four were always at work. The tubes were of copper, and $1\frac{5}{8}$ inch in diameter. The usual speed about ten miles an hour. One engine weighing ten tons on six wheels takes 128 tons of coal. The consumption of fuel is $2\frac{1}{10}$ lbs. of coal per ton of goods per mile. The gross load is more than double the weight of the goods. The cheapness at which they carried was to be attributed to the low speed.

"Mr. Carneghie, in reply to a question from the President, stated, that the Stone Planing Machine had not answered for sharp sand stone; but by endeavouring to imitate the mason's tool, and making the machine work in the same manner as the mason, they had succeeded completely. This tool was a comb with teeth, and curiously enough he had found at Dresden a tool which had been in use from time immemorial exactly similar to that which they had adopted.

"May 9, 1837.—The President in the Chair.

"'*On the application of Steam as a moving Power, considered especially with reference to the reported duties of the Cornish and other Engines. By G. H. Palmer, M. Inst. C.E.*'

"In this paper Mr. Palmer first considers the maximum duty which can be done by atmospheric steam, and then, by reasoning analogically from certain theories, some of which are recognised as established, he infers that highly elastic steam, worked expansively, cannot be as economical as atmospheric steam. The reasoning by which the first question, namely, the amount of duty done, is treated, is as follows:—One bushel, that is 84 lbs. of coal, will convert 12 cubic feet of water into atmospheric steam, or each cubic foot of water is made to occupy 20,328 cubic feet. This may be applied directly to raise a column of water, say 35 feet high; that is, 84 lbs. of coal will, in the absence of all friction, be effective for raising 20,328 cubic feet of water 35 feet high; that is, 1,270,500 lbs. 35 feet high, or 44,573,375 one foot high. Making then the usual deduction of 4-10ths for friction, according to Tredgold's calculations, we have about 26,000,000 lbs. as the effective duty of the atmospheric steam produced by 84 lbs. of coal.

"Mr. Palmer having ascertained the maximum duty of 84 lbs. of coal, proceeds to infer that high pressure steam, worked expansively, must be less efficient than this; and the reasoning by which he arrives at this conclusion is founded on the following theories:—

1°. That the sum of the latent and sensible heat is a constant quantity.

2°. That all matter, steam of course included, evolves caloric on compression, and absorbs caloric on dilation.

3°. That equal quantities of water will always require equal quantities of fuel to convert it into atmospheric steam; but though equal weights of water must absorb equal increments of caloric when atmospheric steam is generated, it does not follow that all the caloric absorbed in high pressure steam is exclusively supplied by the fuel expended.

4°. That steam of two or more atmospheres elasticity does not contain two or more times the quantity of water contained in atmospheric steam, but contains proportionably less water as the pressure under which it is generated is increased.

"The preceding principles are illustrated, explained, and insisted on in great detail, and the author infers from them that the high pressure steam generated by one bushel of coal cannot, when worked expansively, perform more duty than atmospheric steam, unless, as is premised in the earlier part of the paper, more than $62\frac{1}{2}$ lbs. of water can be converted by 7 lbs. of coal from 40° Fahrenheit to atmospheric steam, and unless steam can dilate without converting sensible into latent caloric.

"May 23, 1837.—The President in the Chair.

"The paper by Mr. G. H. Palmer, commenced at the last meeting, having been concluded, a discussion took place on the duties of Engines. The question was asked, whether the water raised had been actually measured, and whether the calculations were not made from the known contents of the working barrel. It was the opinion of several present that the duties had always been ascertained in the latter manner. An engine in which the Cornish system is adopted, near London, has a duty of fifty millions, and the Cornish system of clothing was considered as effecting a very considerable saving in fuel.

"'*Account of some Blasting operations through the white Limestone on the Antrim Coast Road, in the north of Ireland; by William Bald, Civil Engineer, M.R.I.A., F.R.S.E.*'

"In the commencement of the paper, the nature of the Antrim Coast and of the white limestone, and the method of blasting, are briefly described. This limestone is similar to the chalk of England in the flints which it contains, but it is exceedingly indurated. From the results of the blasting of several large masses of rock, it appears that *one* ounce of powder will rend 14·12 cubic feet of this limestone when in blocks; whereas the same quantity of powder was required for 11·75 cubic feet of loose whinstone blocks. The specific gravity of the white limestone is very nearly 2·760, and of whinstone or basalt about 3·200. The induration of white limestone may be estimated from the fact, that two men will bore *one* foot deep in half an hour, the diameter of the augers or jumpers being from $1\frac{5}{8}$ to 2 inches.

"A table is given exhibiting the diameter of the auger or jumper used, and the number of inches of gunpowder put in—*one* pound of gunpowder occupies *thirty* cubic inches. The force of the explosion of gunpowder is assumed to be as the cube of the line of least resistance; if the *one* oz. of gunpowder will open a distance of 1 foot of rock, 2 feet would require 8 oz., and 10 feet 1000 oz. There will be some difficulty in ascertaining the line of least resistance in stratified rocks, since the rock may be fissured, or some bed or opening may lie near to the line bored; but the hypogene rocks, as granite and sienite, lying in compact unstratified masses, present no such difficulty.

"The paper is accompanied by drawings and sections, showing the mode pursued in blasting down high cliffs, by boring at the *toe* of the rock; the peculiar character of the veins commonly called scull veins, from their strong resemblance to the sutures of the scull, which traverse the blocks of white limestone; and concludes by expressing the importance of collecting accounts of the quantity of gunpowder consumed per cubic yard in blasting the various kinds of granite, sandstone, &c.; also the diameter of the augers or jumpers; the depths bored, and the quantity of gunpowder the most effective.

"May 30, 1837.—The President in the Chair.

"'*On the results obtained by Mr. G. H. Palmer, respecting the Maximum Duty of a given quantity of Atmospheric Steam; by Thomas Webster, M.A., Sec. Inst. C.E.*'

"The object of this paper was to show, that the result obtained by Mr. Palmer, in his paper on Steam, read at the two previous meetings of the Institution,* coincides very accurately with the authenticated accounts of the best Watt engines. In the calculation made by Mr. Palmer, no account is taken of the heat rescued by employing over again the hot water. This, considering the relative quantities of latent and sensible caloric in steam, may be taken at one-sixth; and being taken into the account, we may consider that, on the principles laid down by Mr. Palmer, the duty done by a Watt engine ought to be about thirty-two millions.

"The next question is, what amount of saving is to be attributed to the system of clothing adopted in the Cornish engines. This it is stated may change the data entirely; the quantity of water evaporated may be very different; the quantity of heat saved and worked over again incalculable; at

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* See *Minutes*, May 16 and 23.

present then we cannot apply any principles of theoretical calculation to this case.

"'*Further Observations on Blasting the white Limestone of Antrim Coast, by William Bald, Civil Engineer, F.R.I.A.*'

"These further observations are directed more especially to the principle assumed by Mr. Bald in his previous communication, that the force of the explosion of gunpowder is as the cube of the length of the line of least resistance. This is the law which Vauban and Belidor have been led to assume as the result of their investigations, and Mr. Bald proceeds to show that his experiments confirm it. It appears from the experiments there detailed, that 1·9 oz. was required for the smaller blocks, and 2 oz. for the larger, per cubic yard. Knowing then the quantity of gunpowder used, and the solid contents of the blocks, we have only to extract the cube root of the cubical contents of their respective masses. Taking then the length of the line of least resistance in each of these cubes to be equal to the distance from the centre to the nearest point on the surface, we know from the preceding calculation the lengths of these lines, and it appears that these experiments confirm the law of the explosive power of gunpowder, being as the cube of the line of least resistance.

"The paper concludes with remarks on the purposes for which this limestone is adapted, and on the ravages to which all calcareous rocks are subject from the Pholas Dactylus, and is illustrated by drawings of the forms, fissure of the limestone, and of the beautifully radiated and fluted shell of the Pholas. From the curves traced by nature in this shell, the engineer may learn the best shape to be given to the slopes of breakwaters and harbours exposed to the run of the ocean.

"'*On Warming and Ventilating; by James Horne, F.R.S., A. Inst. C.E.*'

"In this paper the author describes a method of warming and ventilating, on the principle of spontaneous ventilation, by means of an iron stove, care being taken that the *quality* of the air is not affected by the iron plates exceeding a certain temperature; and mentions a successful attempt to warm and ventilate a chapel on the same plan.

"Mr. Horne gives also an account of a method which he had adopted to ventilate an extensive drift or level, by forcing in air. The machine, a drawing of which, with all the details and dimensions, is annexed, consists of an upper cylinder inverted, and working in a lower cylinder nearly full of water. An attempt was at first made to ventilate by drawing out the foul air; this, however, did not succeed. The level is 7 feet high, and 4 feet 6 inches wide, and driven a mile before a rise into an upper level; the rise was then put up 400 feet in height; both level and rise were ventilated successfully by this apparatus. The diameter of the ventilating pipe was 5 inches, its length a mile. This showed most satisfactorily that ventilation could be effected by forcing in air through a great length of pipe.

"Some conversation took place on the power expended in producing this ventilation, and on the friction of air forced through pipes; and reference was made to several cases which seemed to show that air could not be forced with effect through a great length of pipe, as for the purpose of blowing blast furnaces, whereas some experiments seemed to show that air could be forced through small pipes of 50, 100, or 150, in length, with the same velocity under a given pressure.

"Mr. G. H. Palmer stated, that if 100 cubic feet of air could be forced through a small hole under a pressure of *one* inch of water in a given time, only 25 cubic feet would be delivered under the same pressure through a pipe 1000 feet in length in the same time.

"Mr. Hawkins stated, that in the old Thames Tunnel a two-inch pipe had been found quite insufficient for ventilation at a distance of 400 feet, but that a three-inch from the same bellows, and under the same pressure, had been quite sufficient. In the former case it was suggested that the friction of the pipe was nearly the same as the pressure in the bellows, so that the air was simply condensed.

"Several other instances and experiments were quoted, and it appears that we must often consider whether the condensation has had time to take effect. The air may be condensed rapidly and none forced out, but if the operation takes place slowly, the condensation will have time to take effect.

"June 6, 1837.—The President in the Chair.

"The subject of forcing air through pipes and of ventilation being resumed, Mr. Cottam stated a case in which a circular blowing machine, having a straight pipe 10 feet in length, and 6 inches in diameter, was sufficient to supply three furnaces, but that a single elbow rendered it incapable of supplying one.

"Mr. Oldham, of the Bank of England, stated, that in all the attempts which he had made to effect any purpose, he always endeavoured to imitate nature. Now nature supplies a large quantity of air slowly heated. He had consequently established a stove with a very large heating surface, and a pump capable of delivering fifty cubic feet per stroke. To get rid of the foul air, he made large openings in the roof, and took care that there should be an abundant supply of air properly heated. The air is brought in at a temperature of 180° F.; thus there is a rapid change of air; and a summer heat is obtained without any sense of oppression. The success which had attended this system during two frightful seasons of typhus and cholera in Dublin, would be attested by many medical men; in the middle of winter he kept the doors and windows open, and threw in abundance of warm air.

"'*On the Methods of Illuminating Lighthouses, and on a Reciprocating Light; by Captain Smith, of the Madras Engineers, F.R.S., A.Inst.C.E.*

"In this paper, Captain Smith details the two different systems of fixed and revolving lights, which are generally adopted, and the objections to which each is liable. In the fixed light, the effect produced is precisely proportioned to the means employed, and none of the light is lost, since none of the reflectors are pointed inland; but in a revolving light, provided the revolution continues complete, part of the light is expended to no purpose. The revolving light is however necessary in many cases, since it is only by a series of flashes and eclipses succeeding in a determined order, that the particular lights on a thickly-studded coast can be distinguished from each other.

"As a means of obviating the objections to which each is liable, Captain Smith proposes, in places where lighthouses are not numerous, to stop the revolution of the apparatus after a certain portion of the circumference has been traversed, and then to reverse the motion so as to cause the light to reciprocate. The action of the reflectors is thus confined to the sea-side only. By this means, a light may be obtained at five-eighths of the expense usually incurred.

"The paper is accompanied by a diagram descriptive of the mechanical contrivance for obtaining this alternating motion.

"June 13, 1837.—The President in the Chair.

"Mr. Oldham resumed the account of his system of warming and ventilating, and exhibited a model of his stove for heating the air. He was convinced that the expedient of forcing the air by mechanical means must be resorted to. He had raised the temperature of a room 24° F. in one hour; by a spontaneous ventilation he could never obtain a temperature of more than 100° F., but by pumping in the warm air he readily obtained a temperature of 150° F., or 180° F.

"Mr. Horne called the attention of the Institution to a lamp which he thought would be peculiarly applicable to lighthouses, or wherever an intense light is required. The usual burners are an inch in diameter; now he had succeeded in producing a clear white light by a burner of half an inch in diameter. The excellence of the light is due to the complete combustion obtained by making the area of the external equal to the area of the internal apertures. The air thus passes directly to the burner; there is a perfect uniformity of draught, the rapidity of which may be regulated by the height at which the burner is above the bottom of the glass, or chimney. The draught of air being thus supplied with perfect equality to both sides of the wick, a flat and steady flame of two inches in height is obtained, and the force of the draught is sufficient to prevent the flame from touching the edge of the burner, so that the edge is always clean and fit for use.

"'*A series of Experiments on the Elastic Weight and Strength of Cast Iron Beams; by Francis Bramah, M. Inst. C.E.*'

"This very extensive series of experiments had been undertaken several years ago, with the view of verifying the truth of the theory of Bernouilli, Young, and Tredgold, with respect to the equality of the forces of extension and compression in cast iron within the elastic limit. The experiments are accompanied with a paper fully explaining the method in which they were conducted, and with a drawing of the proving machine.

"'*A practical Method of forming the Stones of an Elliptic Arch; by William Bald, Civil Engineer, F.R.S.E.; M.R.I.A.*'

"In presenting this paper to the Institution, the author has no object in view but to leave a record of the proceedings of an operation successfully carried into execution more than seventeen years ago. This consists in the application of the well-known property of the elliptic, 'that the lines from the foci make equal angles with the tangent at any point.' The moulds are thus traced out by drawing a few straight lines.

"This plan was adopted in the construction of a bridge over the Owen-More river, in the west of Ireland; and a model of the two courses of the cutwaters of this bridge was presented to the Institution. In these courses the stones are cut so as to break joint with each other, and the blocks are connected together into one course after the manner so ingeniously devised in the construction of the Edystone.

"The meeting of the Institution was then adjourned to the second Tuesday in January, 1838."

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS, No. 2.

BETHLEHEM HOSPITAL.

The tone of my introductory remarks appeared, no doubt, to more than one reader, to partake so much of the Bedlam vein, that they may probably suspect my *habitat* to be not very far distant from the obelisk in Blackfriar's-road. This short flight brings me at once to my present subject, which is no other than the very edifice where, in the opinion, perhaps, of more than one, I am well qualified for occupying an apartment.

And what do I purpose to say of it? Am I going to expatiate on its "front of extraordinary grandeur and beauty"—its "beautiful Grecian portico?" Hardly; unless I am desirous of proving myself to be quite as mad as any of its inmates. Rather should I say that it is precisely the kind of building to captivate the ignorant, and to obtain extravagantly fulsome compliments from ignoramus criticism; for there is plenty of it, and plenty of windows, and is moreover bedizened out with a portico in the true *soi-disant* Grecian fashion; that is to say, it exhibits a bald, common-place copy of columns with Ionic capitals, without a particle

of taste or feeling either Ionic or Athenian, or for the antique at all, in any other respect. Not only is it absolutely crowded with windows, in such manner as to present a most offensive antithesis to all classical precedent, but it is so awkwardly stuck on against the building, that instead of its entablature being continued along the whole of what constitutes the central division of the design, there are three small windows on each side, upon that line. One very injurious consequence of this is, that the portico looks depressed in comparison with the rest, the architrave being below the upper range of windows; so that in addition to having the air of being merely stuck on to the part behind it, this portico looks as if it had been borrowed or stolen from some lower structure. Yet what, it will be asked, was the architect to do? Had he carried up his columns, they must have been proportionably enlarged; which done, other alterations would have become necessary. Or was he, out of compliment to the portico, to omit all the upper windows throughout the whole extent of front?—since to have omitted them in the centre alone would have been of no avail upon the whole, but rather have tended to throw that part even still more out of keeping with all the rest than it is at present. To extricate us from these very perplexing questions, another presents itself, which in this instance is dictated equally by common sense and good taste—namely, what occasion could there possibly be for a portico at all to a building intended for such purposes as Bethlehem Hospital?—where, besides being offensively solecistical, considered in regard to design alone, it is an appendage partaking of ostentation, where ostentation partakes in its turn of hard-hearted mockery of the intense wretchedness within those walls.

If, indeed, it was the architect's intention to parody Grecian art, to bring the practice of modern portico-patching into utter contempt, and at the same time to build up a satire upon vanity, he must be allowed to have succeeded admirably; yet, as we cannot give him credit for such ingenious malice, we must per force attribute to sheer cloudiness of intellect all that he has here done. Do I say all that he has done?—let me add, all that he has left undone. For a man of any talent—any imagination, here was a golden opportunity to produce a work fraught with original expression,—one that would have legibly declared its purpose to every beholder, and would have awed while it delighted him. But—*ach! die verdammte Kunst!* as a German philosopher has it, upon every golden opportunity does it operate like a leaden incubus, smothering not imagination alone, but poor common sense into the bargain, leading us to extract nothing better than a *caput mortuum* of absurdity, seasoned with the quintessence of insipidity.

Of one thing, indeed, the architect has here given us assurance all compact, which is, that by no possibility could he at any time have become an inmate of his building, at least not in the quality of a patient: for that he was infinitely too phlegmatic. Such he must have been in no ordinary degree, where, instead of at all tasking his invention to produce what should display propriety and congruity, if nothing of originality or poetic fancy, he condescended to resort to the hackneyed expedient of tacking a crude portico to a most homespun exterior, and withal so perforated with windows in every direction, as to exhibit a direct contradiction to the style which that feature reminds us of so exceedingly *mal-à-propos*. On the score of economy, it is equally contradictory, since, if it was regard for economy which condemned all the rest to the bareness of the hole-in-the-wall system, to bring in columns merely for the nonce, amounts to a gratuitous and barefaced renunciation of any such principle. Really, there seems to be a kind of fatality attending architectural design in this respect; for as far as columns are concerned, our architects generally contrive to begin where they ought to end—that is, they determine in the first instance upon having columns, whether anything else can be made to accord with them in point of expression and richness or not; instead of endeavouring to make the most of every other part of the design, rendering it subservient to architectural quality, and working it up in such manner that columns may very properly be introduced, as a heightening touch in decoration—a *crescendo* embellishment, and a suitable climax to all besides. It is owing to a disregard of this wholesome principle in composition, that most of our new churches in the "classical style" betray an utter absence of classical taste, or rather, a taste not alone negatively unclassical, but in direct opposition to that manifested in the works professed to be followed. With such a very flagrant example of the misapplication of a portico, as Bethlehem Hospital affords, it might reasonably be thought that subsequent architects would take warning; for even did it possess the merit of being a fine specimen of the kind in itself, and in perfect keeping with the building to which it is attached, it would still be a preposterous inconsistency as the entrance to a building which serves as a receptacle for lunatics and maniacs. How infinitely more becoming would have been a portal in a simple, yet noble style, which, in that case, might have been extended to other parts, so as to have rendered this extensive line of front one consistent façade, whereas at present it exhibits a centre building, with a large *flare up* of a portico—the vulgarity of the expression must be excused for the sake of its forcibleness—placed between two sash-windowed elevations, of most ordinary physiognomy. Of the "grandeur and beauty" which others have discovered in it, we are unable to discern the slightest trace; nor do we think any one can point out any other species of it than that which arises solely from extent, and which is in no small degree counteracted by the petty and truly insignificant character of the features that are crammed into it. Had the architect at all aimed at energy in his design, he would have disposed his windows very differently, have been far more sparing of them in the front of the building, which is now quite cut up, almost drilled and reticulated by them, the proportion between the solid parts and the voids, or the apertures, approaching nearly to that between the bars and interstices of a massive grating.

Undoubtedly, as far as size alone goes, the building is calculated to make some impression upon the spectator—the entire front extending very little short of 600 feet; yet, instead of size being made to contribute to *impressiveness* and greatness, or being at all enhanced by grandeur of conception and nobleness of forms, it is for the most part nullified by a truly lackadaisical insipidity. In architecture, bigness is one thing, and greatness is another, although the public, and those who undertake to guide the public in such matters, do not appear to be aware of the slightest difference between the two, consequently fall into the same unlucky mistake for which a blundering courtier was corrected by Napoleon, who, when the other reached down a book from a shelf for him, saying, "Permettez, Sire; je suis plus grand que Votre Majesté;" sarcastically replied, "Dites donc, plus *long*." So, too, as respects the *plus long*—mere length, longitude, or elongation, the building here spoken of may be allowed to bear away the palm from most others in the metropolis; yet, independently of that qualification, it possesses no quality as a production of architecture, or as more than a piece of mason and bricklayer's work. The *ensemble* is frigidly prosaic, nor is it rendered at all less so by the appendage of a portico, which here shows itself to be nothing else than a flourish of architectural bombast and downright clap-trap. A *design* of this description might be achieved within an hour—and, I should say, an after-dinner hour, were it not that it exhibits no *verve*—not a single particle even of such fancy and imagination as a bottle of wine might infuse into one who was otherwise a torpid and frigid mortal.

Extracts from a Paper, entitled "Considerations, &c.," read before the Architectural Society, on Tuesday, Jan. 2, 1838, by THOMAS HENRY WYATT, *Esq., Vice President.*

HAVING been requested, at a very short notice, to read a Paper before the present Meeting, I have been unable to prepare one in accordance with my own wishes, or which would be likely to interest the attention of those not belonging to the architectural profession. I must therefore draw largely on your kind indulgence, and content myself with laying before you a few remarks which I had put together for the exclusive consideration of our own members. In doing this, I shall probably lay myself open to the charge of presumption for choosing a subject on which neither my age nor practice can render me an authority; still it was one that struck my fancy, and which, if properly dealt with, cannot fail to have some interest. It has also this advantage, that it is one on which no standard authority exists, and where the views of any follower, if founded upon common sense and a high principle of honour, cannot mislead. * * *

Much has already been said and written in objection to the system of competition adopted in this country—various schemes have been devised for its alteration and improvement. I have heard of none that appear to me unobjectionable; for whilst vanity and selfishness form so large a portion of the alloy of human nature, I can conceive no plan, no test of merit, that would prove satisfactory to disappointed candidates.

If I wanted confirmation of this belief, I might cite, as a case in point, the recent decision upon the designs for the parliamentary buildings, where, unless we are justified in setting aside the solemn assertions of the Commissioners (men previously of undoubted honour and truth), there is no ground for believing that interest or partiality had any foul weight. And yet, sir, whilst no decision on architectural competition (certainly within our recollection) ever received the confirmation of public opinion more unequivocally or unanimously, was there ever one that called forth more uncompromising hostility?

By some it has been proposed, that professional men, and those competitors, should alone be judges in these competitions. I will fearlessly ask, if in this case such had been the ordeal through which the designs must have passed, would their decision have been different? And if not, would the wound thus inflicted by the hands of a brother have been thought less unjust, less painful, than as coming from those birds of ill omen, in our day called Amateurs?

Much stress and much objection is applied to the influence of interest; but until you devise some means of effectually insuring secrecy, and until you change the tone of English feeling, you will find interest, which I call *the zeal and energy of friends*, carry a powerful weight.

It is not to the fair and *avowed* exercise of friendship or patronage that

I object; but it is against that unblushing abuse of it, under the garb of "fair play to all parties" (which, I regret to say, has lately been so conspicuous), that I would raise my voice. Much do I wish that some uniformity of proceeding amongst the respectable members of our profession could be laid down as a rule of conduct, and it appears to me a point on which the powers and utility of the two architectural societies might well be brought to bear. Had some acknowledged "*Esprit du corps*" been understood and acted upon, should we have had architects of respectability accepting invitations for plans, &c., addressed to "Builders, Surveyors, and Architects!" Such, sir, was the prelude to more than one advertisement emanating from those most liberal *Guardians* of their own pockets, rather than of the standing and consideration due to an enlightened and useful profession. It is somewhere said, that the repetition of injustice induces the belief on the part of the injured, that their oppressors have the *privilege* of maltreating them. It would really seem as though architects had arrived at this point of submissivenes with respect to competition committees, there being no affront, however barefaced, which they do not seem to have made up their minds to bear.

These repeated acts of injustice, and public affronts to a whole profession, can have only the effect of lowering the members of that profession in public opinion, as manifesting their own disunion and submissiveness. It would be well if, in self-defence, some higher ground could be taken by the profession; but I believe the remedy must emanate from ourselves; for I have no great faith in the honourable and liberal feelings of committees, where men do not hesitate as a body, to commit acts which, individually and separately, few would have courage to acknowledge.

I almost wonder that architects can be found willing to submit plans in the face of such acts of favouritism as have been recently perpetrated. In the cases of public competition recently advertised for at Reading, Leicester, Ashby-de-la-Zouch, and Oxford, the prize has, I am informed, in each case been awarded to *a local architect!* It will not, I imagine, be argued, that IN EACH of these cases the talent of the native practitioner must have shone resplendent over the 20 or 30 other competitors (in some of these cases consisting of men of acknowledged talent); or that such abilities could have lain, as it were, "hid under a bushel," only to be developed by contrast, and the sharpness of a canvass! If, sir, the successful candidates in these instances have the superiority of talent which their selection would imply, it cannot have been the growth of a day;

> "Such flowers mature by parts; must take their time
> To stem—to leaf—to bud—to blow!"

and cannot surely have been unknown to, or unappreciated by, those determined to ensure them a triumph, at the expense of their fellow labourers. How much more manly and just would it be, in the first instance, to avow their belief in the ability of their *protegé*, and their determination to intrust him with their employment! Committees might then openly (as they *now* do privately) make him acquainted with their wants and wishes, and thus secure more perfect plans, without the wasting the time of those to whom time is income. If, after such results, the beginner, in the fulness of hope, throws for such prizes, I would have him prepare his mind for the "influence of interest," if he would avoid disappointment and annoyance.

I would, however, have him fight with every honourable and legitimate weapon which his adversaries can use; but a decision having once been made, I would have him avoid, as he values the high opinion of his profession, and of those *whose judgment he seeks to turn*, all attempts to prejudice a rival, or set aside such decision, unless, indeed, there are grounds sufficiently strong to justify such a course. If successful, there should be such a mixture of modesty and gratitude in our demeanour as will very soon beat down the prejudice and ill-humour of those who had supported other and defeated candidates.

No employment requires such care as that obtained by competition under boards or committees. Too much consideration cannot be given to every reply—too much care and detail to estimates—to contract drawings and specifications—for, surely enough, there will be found on every committee one Joseph Hume, a single false step, a glimpse of extras, however distant, puts you in his power, and you are not likely to be dealt with less vigilantly, less mercilessly, than is the unfortunate propounder of Ways and Means in the House of Commons by this peerless economist.

In the different meetings which previous to commencing and during the progress of the works you will be expected to attend, your opinions on many points will naturally be required: these should be given with much consideration, but with firmness; for, in endeavouring to suit our opinions to the conflicting ones you will hear urged, I believe that the invariable result is, that you *satisfy none*, and impress several with the idea, that having no decided opinion of your own, there can be neither science nor experience on which to found one.

Your sketches once approved, contract drawings and specifications are generally wanted, as hurriedly as the committees have been tardy in making up their minds to build. But in these the architect should never consent to be hurried improperly. Time and consideration in preparing them are the only guarantees against oversights; and when the results of these show themselves in bad construction or unexpected changes, the committee will have forgotten the haste, and *you alone* will be the scape-grace. These drawings cannot be too minute, or the specification too much detailed; and I would strongly urge the advantage of furnishing all the drawings before the contract is entered into, instead of promising detail drawings during the progress of the work, as I hear is too frequently done. It almost invariably produces dissatisfaction on the part of the contractor, and, in my opinion, carries with it a certain degree of injustice on the part of the architect, who must either imagine that the builder can divine his *exact ideas of decoration*, or he must consent to his employer being charged, perhaps, an exorbitant sum to cover the future flights of his fancy.

On the subject of furnishing the builders with the exact quantity of materials, &c., from which they are to estimate, some difference of opinion seems to exist in our profession.—Some think that the architect should have nothing to do with this part of the business, and that in doing so, he involves himself in a dangerous and unnecessary responsibility. Others (of whom I am one), argue that the architect should be aware from what quantities the estimate is made, and that the way of ensuring the fairest competition is to furnish all with the same data. In London it has become so general a rule with the large builders, that they will only furnish tenders on their own terms; and they will not incur an expense which is not to be repaid by the employer. Neither will they run the risk of oversights or inaccuracy from employing only one party to take out the quantities; but in cases where the architect does not insist upon appointing one surveyor on his part, they appoint two; nor do I see that any valid objection can be urged against this caution on their part. On whom can the cost of making this accurate and detailed estimate fall so justly, as on the party for whose use it has been calculated! It is one that may very fairly be considered as contingent upon the benefits of competition; for it would be rather too much to expect builders to incur the risk and odium of cutting each other's throats (and frequently their own) with the additional privilege of incurring a heavy expense for this chance. The architect may fairly claim to appoint one party;—the employer should pay the expense, and the advantages of having a *mutually acknowledged* measurement of quantities to refer to in case of dispute or misunderstanding, must, I think, be fully equal to its cost, and can entail no responsibility on the architect with which he may not fairly be charged.

On the principle of believing "every man a rogue till you find him honest," prepare your contract drawings as though you anticipated quibbles and trickery of every kind, and in every trade. If the builder starts with the idea of *scamping*, this will soon pull him up; if he intends to complete his work honestly and conscientiously, he will merely be spared the trouble of thinking what would be necessary.

I will suppose that the site, the aspect, the foundations, and the materials of which the building is to be erected, have been considered before the first sketches were made—but I will not suppose that any decision on these points has been so perfect as to be incapable of improvement. The increased intercourse with the locality which the fact of his employment will necessarily cause the architect before his building is commenced, will afford time and opportunity for each observation and inquiry on these heads. Too much care cannot be given to the selection and testing of materials; this should be a primary inquiry—for I hold, that design and construction should be made applicable to the materials at your command, and not, as I have known, expensive and uncharacteristic materials forced into a design. The proper aspect for a building is so dependant upon circumstances, and the fancies of individuals, that it would be difficult to lay down any definite rule. Aspect should be more considered than prospect, and these relatively studied when the weather is unfavourable as well as fine, in order that the judgment may be exercised towards every circumstance and defect.

In these decisions, our employers generally require, and indeed they have a right to do so, the indulgence of their own whims; and the ingenuity of the architect (who, to design successfully, should have studied and experienced the wants and habits of the different classes for whom he may be employed) should consist in making the most of these prejudices, rather than in endeavouring to force his own ideas on those who will, at best, give him but a *reluctant* acquiescence.

This, however, should not include a frank and honest showing of that which we conceive to be best adapted to the objects in view.

The contracts once signed, and the works commenced, you are brought into connexion with parties who have your credit and comfort much in their power (dependant though, as I have invariably found it, on your conduct and manner to them). Between unnecessary hauteur or severity and a culpable laxity, there is a happy medium which should be acted upon. There should be a cordiality and confidence existing between the architect and builder; whilst, on the one hand, I would vigorously protect my employer from any thing approaching to fraud or illiberality, so would I not hesitate to assist the builder, to listen to his views or proposals, and where I conscientiously believed that his suggestions could in no way prejudice my employer, though they might benefit him, I would gladly act upon them; with common courtesy, common confidence, and such concessions only as can be honourably and properly made, I believe architects might be very free from annoyance during the progress of the works, and from odium after their completion. * * *

The difference between London and country practice is greater than would at first be imagined. In the former, you are almost invariably hampered by acts and by-laws, many of the most absurb and unintelligible nature; difficulties are raised by parties, frequently with no other object than annoyance and litigation. You are subjected to the inconsistencies of the Building Act, or to the whims of Paving Boards and Sewer Commissioners; and though last, not least, your works are generally tested by severer rules of criticism, and less partial judges, than in the country. There, you have little more to consider than that your building shall be no injury or annoyance to those on whose property it abuts, and that it shall not encroach on public or private conveniency.

I may here be allowed to say a few words on the subject of *landscape gardening*, a pursuit so enjoyable in itself, and so intimately bound up with our operations, that I am almost inclined to lay exclusive claim to it for the architect; at any rate, I must contend that those who have felt and studied the peculiarities of certain scenery, and have designed buildings to harmo-

nize and group with those features, must be as competent to work out a general "tout-ensemble," as the fashionable landscape gardener, who in his morning ramble levels wood and hill as with a magic wand, and who will, perhaps, not condescend to consider the character of the house as influencing his decisions. "The picturesque eye is not limited to nature, but ranges through the limits of art—the picture, the statue, and the garden may be equally the objects of its attention." It does not therefore follow (as some imagine), that from the architect's intercourse with works where proportion and order and regularity are essentials, our ideas on picturesque effect must necessarily be warped; taste is intuitive, and may be as judiciously and picturesquely applied by the architect in working out and bringing together the beauties of nature in the park or garden, as in proportioning and adjusting those of art in the portico or tower. I know no education that will give taste, where none is inherent. Neither rule nor axiom will carry you through her varied bearings; and I cannot help thinking, that he who has a natural love for scenery, who has studied the various effects of light and shade, of distances and of contrasts, and who has, to a sufficient extent, the power of embodying in his own mind the effect of contemplated alterations, and, in the mental eye, to judge accurately of the results, is as well qualified to *garden a landscape* as a Repton or a Gilpin. I have made it a point, in cases where I have been employed in the country, to be indulged with the general arrangement of the adjoining grounds; considering it so intimately connected with the spirit of the design, and so gratifying an occupation in itself. The architect need not be deterred by the want of *practical knowledge* as to the species or growth of trees, &c.; it seldom happens that the head gardener of any establishment where such occupation would probably be required, is not qualified to render you every assistance in practically working out your ideas and intentions. If we bear in mind this undoubted fact, that "*simplicity* and variety are equally sources of the sublime as of the beautiful," we shall seldom err.

The fault of some scenes that have passed through the ordeal of landscape gardening is, that there remains either an affected simplicity, or that nature has in the generosity of her doctor been sadly surfeited. Hill and dale, wood, water, rock, and heath are unceremoniously jumbled together, without thought of harmony or consistency;—

> "If thy skill should fail to people well
> Thy landscape, leave it desert,"

was the advice of one considered a good authority on these matters; it certainly is a safe one. * * * *

ROYAL INSTITUTION, EDINBURGH.

Sir,—I should feel obliged to any of your correspondents who could furnish some information of this building, since it appears to have undergone very material alteration since its first erection, amounting almost to an entire metamorphosis, and one that is a decided improvement upon the original design. I say 'appears,' because I have never heard of such alteration having been made, neither is there a syllable relative to it, in the very work which gives a view of the building, in what must naturally be concluded to be its present and actual state; namely, the recent publication entitled 'Caledonia,' edited by Dr. Beattie. It is strange enough that there should be no description whatever of the building; but it is still more strange that the Doctor should have been, or else have chosen to appear ignorant of a mere matter of fact, and certainly a rather important one. Besides which, the alteration itself must be one of very recent date—subsequent to the publication of 'Jones's Views of Edinburgh,' because the representation there given of the Royal Institution, exhibits a design altogether different. There, the portico beneath the pediment consists merely of a single range of eight Grecian Doric columns, advanced one inter-column before the general front; but this part is now, it would seem, greatly extended, as regards its projection, by the addition of another range of columns, and at such distance as to give three columns, and as many inter-columns, at each end or return of the portico. Neither is the change confined to this alone, the metopes of the frieze being ornamented with wreaths, and the tympanum of the pediment with a rich arabasque foliage of Grecian design, filling its entire space; besides which, the podium, against which the pediment abuts, has received some sculptured ornaments, and columns supporting lesser pediments have been added to the lateral façades, to say nothing of other variations. Notwithstanding all this, the Doctor takes not the slightest notice of there having been any change made at all; which odd silence, even were it a perfect matter of indifference to the rest of the world, is anything but complimentary to the 'gude folk of auld Reekie!' Yet almost any other writer would have deemed it incumbent upon him to have given some account of such change, and informed us both when it took place, who promoted it, and who was the architect employed to carry it into effect, and finish up Mr. Playfair's design as it is at present. Or, are we to suppose, that the Doctor was not himself aware that the building had been any way altered, perhaps never saw the view given of it in his work until after it was published? In the latter conjecture there is nothing particularly monstrous, because to write such letter-press as he has furnished, there was no occasion for him to make himself acquainted with the plates beforehand; nay, it is very possible, that he considers them to be the mere filling-up stuff of the work—the childish garnish with which the publisher has thought fit to bedizen, and almost overlay the *literary* portion of it. For aught I can tell, Dr. Beattie may be a 'Beatus Doctor' in every other respect, but he deserves to be a *beaten* one for his scurvy cavalier-treatment of architect and architecture, as being altogether undeserving of notice. Some one of your Edinburgh readers will, I trust, now supply the information the Doctor has forgotten, and for which I now most humbly petition.

P. DRYWATER.

JOYCE'S WARMING APPARATUS.

A contrivance for warming apartments, &c., has been some time past on exhibition at the Jerusalem Coffee-House; this consists in external figure (no explanation being afforded of the nature of its contents) of a copper cylinder about eighteen or twenty-four inches high, and six inches diameter, with a small orifice at the top, through which the vapours given off by combustion passes. It would be premature to offer opinions until the nature of the invention is more fully displayed; but it is asserted by the inventor, that a cylinder of the dimensions above quoted will warm a room of twelve feet square and ten feet high, up to sixty or seventy degrees, an assertion we scarcely think it possible he can confirm: the apparatus, when we saw it, was not hotter than two hundred and twelve degrees, and how it is possible a heating surface, about three feet super., not greater than a common tea urn, can heat up a room of the above dimensions, when it requires a surface of iron pipes filled with hot water of ten times the surface to produce the same effects, is to us inexplicable, the mere surface of one moderate size window, twenty feet super., cooled down by the external air to perhaps four or five degrees below the freezing point, is six to eight times the surface of the warming apparatus at two hundred and twelve degrees; it would be therefore impossible, by the application of this means, to keep up the heat of the window to anything like the temperature of sixty degrees. We are afraid there must be some mistake in the inventor's calculations, and unless the heat can be increased in intensity, or the surface enlarged, or both, it will be found useless for the purposes to which it is proposed to apply it; and if the intensity of the heated surface, or the air escaping from the funnel, should be made to exceed two hundred and twelve degrees, the apparatus will be subject to all the objections attending hot air and German stoves, which, by their high temperature, destroy the oxygen of the atmosphere, and render the air exceedingly noxious and poisonous.

INCRUSTATION OF BOILERS.

Sir,—In your Journal for December, 1837, under "Steam Navigation," the attention of your readers has been called to the observations of Dr. Lardner, at Hull, &c., on the incrustation of Marine Boilers.

It is stated that "copper, having a detergent power, and not being a recipient of deposit, becomes an effectual remedy when substituted for iron, the incrustation of which causes a great loss of fuel."

I beg to remark, that as the deposits are separated simply by the operation of boiling, and in quantity proportionate to the concentration of the sea-water, a copper boiler, under the same circumstances, would be incrusted equally with an iron boiler, while the chances of injury to the former would be increased, from its being a better conductor of heat, and less able to withstand its effects than the latter.

These facts are borne out by the condition of Marine Copper Boilers now in use, as well as by those which were laid aside some time since after service at sea, where considerable injury had been sustained in the parts most exposed to the fire from the effects of incrustation, specimens of which were preserved by many as curiosities. Your's, &c.

Woolwich, *January* 19, 1838. NAUTICUS.

BRICK AND CEMENT BEAMS.

Sir,—We observed in the December number of your interesting work, (page 45) an article respecting the Brick Beam erected on our premises at Nine Elms. It is, generally speaking, a correct representation; a little error, however, with respect to the iron hooping laid longitudinally in the beam, may mislead, which we therefore mention, and at the same time beg to enclose the accompanying sketches of its elevation, &c.*

Your correspondent A. C. E. truly observes, that only five iron-hoops are visible, whereas, we believe, there are not less than ten or a dozen laid in the *work*. The fact is, that all the hoops were inadvertently cut off parallel with the face at the time of its erection, and the five ends now projecting are merely pieces introduced to show that iron was used.

Considerable interest has been expressed by scientific persons, as to what further weight the beam will carry: an opportunity will offer shortly to ascertain the fact. The London and Southampton Railway Company requiring that portion of our premises on which it is erected, we have fixed Wednesday, 14th February, at 12 o'clock, for the time when we purpose to load it until it breaks down, and when any of your correspondents, who may be so disposed, may witness the operation. Sir, your obedient servants,

January 20, 1838. CHARLES FRANCIS & SONS.

RAILWAY CHAIR.

Sir,—In looking over the last number of your Journal, I observed a description of a new chair and mode of fastening by Mr. Curtis. I beg to state, that the chair he describes, viz., with the place for the key rounded in the middle, has been used nearly two years for the strong rails which have lately been laid to replace the old ones on the Liverpool and Manchester Railway, and the manner of keying he describes, was proposed by me about nine months ago, to remedy the defects of the wood key introduced by Mr. Locke; but I could not procure its adoption, although its advantage over the common kind of wood key is pretty evident.

I do not wish it to be understood that I consider Mr. Curtis to have gained the idea from me. I merely state a fact, to show that he has not been the first to bring the method forward. Yours, &c.

Manchester, *Jan.* 4, 1837. GEORGE SCOTT.

* We have deferred publishing the sketch until next month, when we shall be able to show them to more advantage, accompanied with our observations on the fracture of the beam that is to be broken on the 14th instant.—Editor.

ON WARMING BUILDINGS BY HOT WATER.

Sir,—In the last Number of your Journal you published a review of a work recently written by me "On Warming Buildings by Hot Water, &c." I am gratified by the favourable opinion you have expressed of the general character of this work, and I feel obliged by the fair and candid tone of your remarks on those parts of the treatise which you consider are liable to objections. Those remarks appear evidently to have been made with the desire of forwarding the progress of a useful invention, the principles of which are but imperfectly understood; and I am therefore induced to make a few observations on those remarks, which I should not otherwise have done.

The objections which you urge against the work in question are, that the deductions are not sufficiently based on practical investigations, and that they rest too much on theory. This, however, I shall show is not the case; were it so, your remarks would be eminently just. One passage in the book has apparently escaped your observation, which, had it been observed, might probably have altered your opinion as to its theoretical character. At page 56 it is stated—"The correctness of the theories advanced in this treatise, which are of a practical character, and admit of verification, have been tested, more or less extensively, by actual experiment, and do not, therefore, rest merely on hypothetical reasoning." The mode which you have pointed out for experimentally determining the proper proportions of the apparatus for different buildings, is, as nearly as circumstances would permit, the method which I adopted, in the first instance, for this purpose. By these means I obtained the practical rule given, Art. 159, for ascertaining the quantity of heated surface required in any particular building, by merely dividing the cubic measurement of the building by certain numbers there given. This rule has since formed the basis of calculation, in many cases where the apparatus has been erected in a most successful manner, and its general accuracy has thereby been ascertained. But it is evident that such a method can only give an average result, however extensive and varied the experiments may be. Not only would the same apparatus produce very different effects in different buildings, but the same apparatus would produce different effects in the same building, with every change of temperature, external as well as internal. For an apparatus, for instance, which, at its maximum intensity, would raise the temperature of a building 30 deg. in cold weather, would not raise the temperature 30 deg. in warm weather; and it would be impossible, by any such mode of experimenting, to ascertain either the law of its variation, or even the cause of it.

But the method which I adopted of calculating from philosophical data of acknowledged accuracy, enabled me to estimate all the causes of variation of these effects, and to apply proper corrections for them in practice. By applying the laws of the theory of heat, the cause of many effects which appeared discordant in their results became obvious. I will not, however, occupy your valuable pages by describing these various results, but will confine my remarks to your objections to the experiments having been made on a small scale.

I need not adopt the axiom, that matter obeys the same laws in the *atom* as in the *mass*, and that therefore the size of the body experimented upon was unimportant. A different and a far better reason can be given for the plan which was adopted. In order to calculate the effects by the laws of specific heat, when applied to this inquiry, it was necessary to ascertain by experiment the rate of the diffusion of heat from iron and from glass. If a large heated surface had been employed in these experiments, the temperature of the surrounding air would have been instantly raised, and this would at once have altered the rate both of radiation and conduction from the heated body, and the experiments would therefore have been wholly futile. To avoid this consequence, it was necessary to employ a moderately small body; and even with all the precautions which could be adopted, the rise in the temperature of the air could not be entirely prevented; although, in the experiments in question, it was of but small amount, and therefore could easily be allowed for in the calculation. The body employed was, however, sufficiently large to obtain the most perfect accuracy, and the calculations deduced from these experiments are, I conceive, for these reasons, far more accurate than if they had been conducted on a larger scale. The rules which I was enabled to form from these experiments agree, in a majority of cases, in a very perfect manner with the practical rule already mentioned; and where a difference occurs, they distinctly show the cause of that difference. Had I not possessed a practical rule obtained by comparisons of working apparatus, I should not have felt justified in broaching the other rules deduced principally from philosophical data; but having proved their accuracy in this manner, I had no hesitation in giving them as rules which might be adopted in all cases with the most perfect safety.

Your observations respecting the great difference which occurs in the consumption of coals, in different apparatus, in the warming of buildings, are perfectly correct. But it is, I consider, equally correct, that no investigation such as that you have pointed out, would satisfactory account for this difference, except so far as the furnace might be constructed on good or bad principles. But with low pressure steam-engine furnaces, there is not so great a difference in the results. The consumption of coal can then be estimated with tolerable accuracy by its effect in producing a certain quantity of steam; and pursuing this subject in connexion with the laws of the radiation of heat from pipes under different circumstances, as exemplified by the experiments above mentioned, it at once became apparent that the consumption of coal, in a hot-water apparatus, by no means continues constant even in the same apparatus; but that it depends upon a multitude of circumstances which are continually varying, and which are very greatly different in different buildings, and with different apparatus. The table given, Art. 154, clearly points out the cause of this difference. It shows, that, independent of any difference in the construction of the furnaces, the consumption of coal depends upon the difference of temperature between the heated surface and the circumambiant air; and as this again is governed by the temperature of the external air, the quantity of glass, the form of the building, the quantity of pipe, the amount of ventilation, and many other causes, the reason of the great difference which occurs ceases to be a matter of surprise. But the mere inspection of working apparatus, and a comparison of the quantity of coal used in each, while it would plainly show the difference which occurs in this respect, could not in any manner explain the cause. An inquiry into the theory and the laws of heat, was, I think, necessary for this purpose; but whether sufficient explanation of this part of the subject is given in my work, I leave to others to decide.

I might allude to other matters connected with this subject, but I am unwilling to trespass further on your valuable columns. Enough has, perhaps, been stated, to show that the deductions contained in the work in question are not of a theoretical, but of a practical character. Experience has convinced me of their accuracy; and from a tolerably extensive acquaintance with the wants of those for whose use the work was chiefly designed, I have reason to believe it will be found useful. I shall, however, be happy to avail myself of any hints that may be given on this subject, for the purpose of making any further experiments that may be useful; for, no doubt, there is much yet to be learned before this invention can be considered to have arrived at perfection.—Your's, obediently,

London, Jan. 12, 1838. C. HOOD.

HOUSES OF PARLIAMENT.

Abstract of the Tenders delivered by Builders for the Embankment and the Terrace, and a Portion of the Foundation of the Buildings, of the Houses of Parliament.

	£.
Hugh MacIntosh . . . . To complete the coffer-dam within seven months. To finish the whole of the works within twelve months.	82,000
William Cubitt . . . . To complete the coffer-dam within eight months. To finish the whole of the works within fifteen months.	77,500
George Munday . . . . To complete the coffer dam within eight months. To finish the whole of the works within two years.	93,800
Henry and John Lee . . . . To complete the coffer dam within eight months. To finish the whole of the works within sixteen months.	74,373
George Baker and Son . . . . To complete the coffer-dam within nine months. To finish the whole of the works within eighteen months.	74,450
Grissel and Peto . . . . To complete the coffer-dam within ten months. To finish the whole of the works within twenty months.	83,900

The Tender of Messrs. Henry and John Lee being the lowest, was accepted.

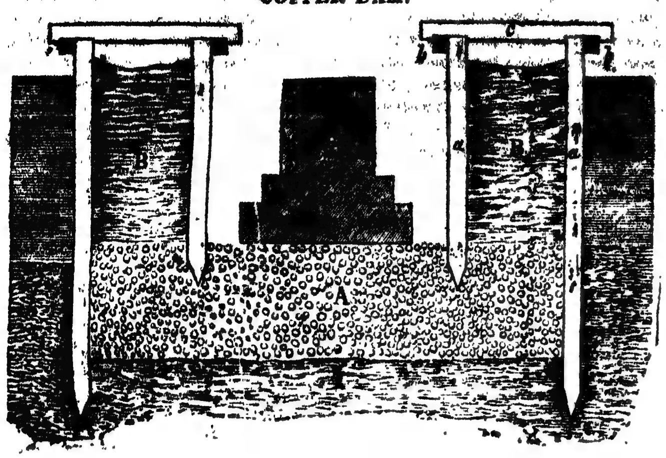
Estimate, made in part by Messrs. Walker and Burgess, engineers, and in part by Mr. Barry, the architect, for the embankment to the river, with steps, coffer-dam, &c., examined and adopted by the Surveyors of the Office of Woods and Works, and contained in the Report made by the Commissioners of Woods and Works, and laid on the table of the House of Commons		44,000
The Tender of Messrs. Lee, for the embankment and the terrace, and a portion of the foundation of the buildings of the Houses of Parliament	£74,373	
Deduct the amount agreed to be allowed by the Contractors for the materials of the dam, after it has served its purpose	7,000	
	£67,373	

N.B.—The works included in the above Estimate of Messrs. Lee were proportioned by Mr. Barry in the following manner:—

Cost of the embankment wall, with the steps, coffer dam, &c., included in the estimated sum of £44,000	£42,465
Cost of further works for the foundations, considered as part of Mr. Barry's general estimate for the building	24,908
	£67,373

The Parisian Casinos.—Musical casinos are now all the rage at Paris These music halls are daily opening one after the other, and surpass each other in architectural splendour, and in the profusion of lights and looking-glasses. The *National* of Friday gives a description of the Casino Paganini. It is more rich in its artistical embellishments than its predecessors of the Rue St. Vivienne and St. Honore. Nothing more tasteful nor more dazzling, says the report, can be imagined.

COFFER DAM.



Cross Section of a Coffer Dam, a la Treussart.

a a exterior and interior sheet piling to confine the puddling *B*; *b* waling to connect the sheet piles; *c* cross-ties notched on to the waling; *A* bed of *beton** to receive the masonry, *C*.

In a recent publication on mortar by General Treussart, of the French Corps of Engineers, the following method of securing a firm bed for foundations, in any depth of water, is proposed by the author. The area on which the structure is to rest, is first enclosed by strong sheeting piles, (as shown in the above figure,) driven sufficiently deep to take a firm hold of the soil. The bottom, within this area, is next scooped out to a depth of 6 feet, and the soil removed is replaced by a mass of beton of the same thickness. While the mass of beton is still green, a second row of sheeting piles is driven into it, about 6 inches, leaving an interval of 5 feet between it and the first row. This interval is then filled by a compact puddling, care being previously taken to secure the rows of sheeting piles from yielding laterally. A water-tight dam is thus formed, and the water is pumped from the enclosed area. If, from the permeable nature of the soil at the bottom, it is feared that the pressure of the exterior water, on the under side of the mass of beton, might throw it up, then it would be necessary to lay a provisional weight on this mass, before the water is pumped out; this weight being gradually removed as the structure advances.

The immersion of beton, for foundations in water, requires great care. The best plan seems to be, to use a bucket with four sides, the top being wider than the bottom; it is provided with an ordinary handle, to which a small rope is attached, for the purpose of raising and lowering it in the water. A cord is attached to the bottom of the bucket, to upset it and throw out its contents. The beton broken into blocks of about half a cubic foot, is placed in the bucket, lowered near the spot it is to occupy, and is thrown out. By this means, it is deposited in the mass in a compact state, which is essential to the firmness of the mass; for, were the beton thrown into the water at the surface, the greater part of the lime would be separated from the other elements before it reached the bottom.

To prevent voids in the different layers, each one should be firmly pressed by a ram, whilst the beton is still green, and a fresh layer must not be laid until the other has partially set.

Another precaution is also necessary to form a perfect union between the layers. Whatever pains may be taken in lowering the beton, some of the lime will wash, and remain suspended in the water; this will, finally, settle into a thin cream on the surface of the layer, and would prevent a union between it and the succeeding one if not removed. To effect this, when there is a current of water, two holes may be made in the coffer-work just below the surface of the water, to form, when left open, a current through the enclosed area. By agitating the water within the area, the lime held in suspension will be gradually carried off through the holes by the current. Or if this plan cannot be adopted, the lime, after it has settled on the surface of the layer, may be carefully swept into a corner by means of a broom, and be taken out by a scoop.

Where the area, occupied by a structure, is very considerable, and the depth of water great, the methods which have thus far been explained cannot be used. In such cases, a solid bed is made for the structure, by forming an artificial island of loose heavy blocks of stone, which are spread over the area, and receive a batter of from one perpendicular to one base, to one perpendicular and six base, according to the exposure of the bed to the effects of waves. This bed is raised several feet above the surface of the water, according to the nature of the structure, and the foundation is commenced upon it.

It is important to observe, that, where such heavy masses are laid upon an untried soil, the structure should not be commenced before the bed appears entirely to have settled, nor then, if there be any danger of further settling taking place from the additional weight of the structure. Should any doubts arise on this point, the bed should be loaded with a provisional weight, somewhat greater than that of the contemplated structure, and this weight may be gradually removed, if composed of other materials than those required for the structure, as the work progresses.

To give perfect security to the foundations in running water, the soil around the bed must be protected to some extent from the action of the current. The most ordinary method of effecting this, is to form what is termed an *enrockment* around the bed, by throwing in loose masses of broken stone of sufficient size to resist the force of the current. This method will give all required security, where the soil is not of a shifting character, like sand and gravel. To secure a soil of this nature, it will, in some cases, be necessary to scoop out the bottom around the bed to a depth of from 3 to 6 feet, and to fill this excavated part with beton, the surface of which may be protected from the wear arising from the action of the pebbles carried over it by the current, by covering it with broad flat flagging stones.

When the bottom is composed of soft mud to any great depth, it may be protected by enclosing the area with sheeting piles, to prevent a lateral spread, and then filling in the enclosed space with fragments of loose stone. If the mud is very soft, it would be advisable, in the first place, to cover the area with a grillage, or with a layer of brushwood laid compactly, to serve as a bed for the loose stone, and thus form a more stable and solid mass.

* *Beton* is made by mixing lime as a matrix with broken stone or rubble in fragments.

IMPROVED FRENCH CABLE.

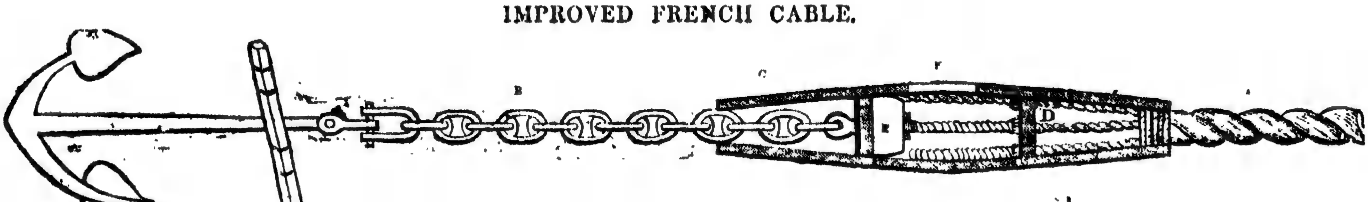


Fig. 1.

Fig. 2.

A combination of the hempen with the chain cable has been introduced into the French Navy, with some success; the chain cable is affixed to the anchor in the usual way, in length from twenty-five to forty fathoms. The object of this arrangement is to allow the chain to drag along the bottom of the sea, and prevent abrasion to the hempen cable; thus it is supposed, that greater elasticity is produced than can be obtained by a chain cable alone, and the durability of the hempen cable is ensured for a greater length of time; the cable being lighter and more manageable, is more favourably adapted for the evolutions of the ship, either in casting or weighing anchor, likewise for kedging; the advantages of lightness are evident; many other points of recommendation will present themselves to parties interested in this subject, besides that of cheapness. M. Fouque, the inventor of the method by which the chain and hempen cable are united, has designated his contrivance with characteristic French vanity, "fouquière;" this consists, as will be perceived by reference to the plate, of a kind of barrel-shaped ferrule, F, of metal, into one end of which is inserted the end of the hempen cable, A, and into the other the corresponding end of the chain, B; these are prevented from withdrawing from the ferrule by two conical glands, D E, one inserted within the strands of the cable, and the bolt of the chain passing through the other, so that when the chain is extended, the glands jamb fast within the ferrule, and are of course held the faster the greater the strain on the cable; for the purpose of fixing and disengaging the two cables, holes are left in the ferrule, by which the glands are withdrawn, which are easily loosened by drawing the ferrule forwards when upon deck.

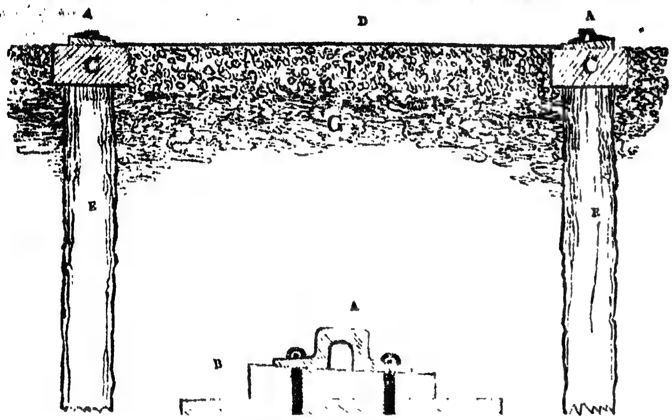
Description of Engraving—Fig. 1, is a section of the ferrule, showing the connexion of the two cables. Fig. 2, plans of the glands D and E.

A, hempen cable; B, chain cable; C, ferrule; D, E, glands; F, hole in ferrule for withdrawing the glands; the gland E for the chain, is made with a slit to pass the bolt of the chain into the centre, as the stud is fixed upon the bolt with a rivet fastening; and the gland D, is made with three or four slits or grooves, to receive the strands of the rope, which are tied in knots to prevent them slipping through.

Another method is to substitute a broad ring instead of the ferrule, and unite both chain and cable into one joint, by passing the bolt of the chain through the centre hole of the gland for the hempen cable, and then wrapping the strands and chain with a wrapper, and binding the whole with yarn in the usual way.

CONSTRUCTION OF THE GREAT WESTERN RAILWAY.

This railway, on account of its deviation from the ordinary mode of constructing railways, is watched with considerable interest by the profession and the public; it is our intention to collect as much information as we can, and lay the same before our readers; we have taken the earliest opportunity of obtaining the particulars of the method of laying the rails, which we illustrate with an engraving.



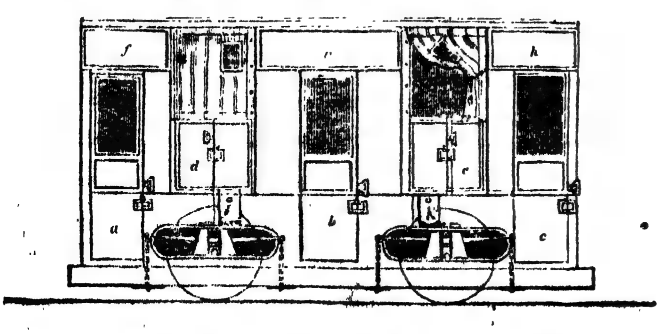
EXPLANATION OF THE ENGRAVING.

AA wrought-iron rail screwed down to sleeper; B a featheredge or wedged-shaped board of oak; CC sleepers of timber; D iron tie-bar to connect the two sleepers; EE piles eight feet long, and eight inches diameter, pointed at the lower ends; F ballasting; G embankment.

Formation of the Railway.—On the embankments, piles of beech trees Kyanized, about eight feet long and eight in diameter, are driven by a pile engine, at distances of fifteen feet apart, on each single line of rails, and so arranged that the piles of the corresponding rail are placed opposite to the intermediate distances, and not opposite to each other, thus: o o o o o upon these piles are laid longitudinal continuous sleepers of Memel timber Kyanized, thirteen or fourteen inches wide by six and a half or seven inches thick, which are firmly bedded on the ground, previously made even and well rammed; on the top of the sleepers are laid the rails, with an intermediate distance of seven feet half an inch in clear of the rails; between the rail and the sleeper is a featheredge or wedge-shaped board of oak, or hard wood, eight inches wide and one and a half inch thick on the outer edge, and one and a quarter inch thick on the inner edge, which gives the rails a slight pitch inwards, so as to make the top coincide with the levelled or conical rim of the wheels, which touches the rails with a bearing equal to the width of the top of the rails, instead of a point, as in the ordinary mode of laying them. The rails are of wrought-iron, rolled in lengths of fifteen feet, as shown in figure 2, and made hollow; the top is two inches wide, base six inches, and height one inch and three-quarters; holes are punctured in the flanges on both sides, about eighteen inches apart, to secure the rail (*without chairs*) to the sleepers, by means of screws eight inches long. To prevent the sleepers from spreading, there are, at every fifteen feet, iron ties across the railway, spiked down at each end to the sleepers; the surface of the roadway is finished with ballast in the usual manner.

BOSTON AND PROVIDENCE U. S. RAILWAY CARRIAGE,

INVENTED AND BUILT BY W. J. CURTIS, LONDON.



The carriage, of which the above is a correct drawing, was built as a pattern carriage for the above railway, in 1836; it is made upon the same principle as those of the London and Greenwich Railway Company, viz., by placing the frame below the wheels, and bringing down the centre of gravity to within a few inches of the rails. It will be perceived, upon reference to the plate, that it consists of five distinct compartments, or coaches; the floor of three is immediately upon the top of the frame, and twelve inches only from the surface of the rail, so that passengers step in and out with as much facility as from a sedan chair: the middle compartment has double seats, like a mail coach, and the two end bodies single seats, like a chariot; the two bodies over the wheels have also single seats, and may be either close bodied or open, with a leather curtain, as drawn; passengers get in, or alight, by steps similar to those of a barouch: the spaces over the low bodies may be employed for luggage, forming a commodious safe depot for that purpose; if it should be desirable to form the mail coaches upon this principle, the space over the wheels may be formed into the holds or receptacles for the mail bags, thus placing the heaviest load over the wheels; also, if desirable, the roof may be adapted for outside passengers. It is evident, from the construction of this coach, that it is absolutely safe; by no possible chance can it ever upset; it does not cost more than the railway carriages usually adopted, and by being absolutely safe, is not subject to the accidents to which the others are so exceedingly liable; and by placing juggles upon the cross-pieces of the frame, descending so low as to clear the crossings, and setting them back from the wheels, little more than the breadth of the rail on each side, in the event of the wheels leaving the rail, the frame backs in with either the one rail or the other, and thus the carriage is retained to the rail under all possible circumstances: this is a very valuable point; for when it is recollected, that almost every railway is formed, for fully one-third of its extent, upon embankments without parapets, which renders it very dangerous for an engine or carriage to be thrown off the rails upon them, this provision provides a remedy for the case, to be met by no other equally simple, cheap, and efficacious arrangement. The mode of connecting each carriage is by a solid link; to either end of the frame is affixed a spring, one of which is a buffer, the other a drag-spring, so that when the carriages are arranged in train, a buffer and drag-spring are connected by the inflexible link; by this means all the requisite elasticity is insured to the train, and the disagreeable shocks, incidental to the mode of connexion by chains, is entirely avoided.

The carriages upon the Greenwich Railway were altered by me, from the old and general plan of those upon the Liverpool, Birmingham, and other lines; this alteration is effected by simply inverting the frames, thus making a most unsafe carriage absolutely safe. I do not recommend any person to copy the form of carriages upon that line, but to adopt the form represented in the plate, which will be found in practice the most commodious of all others; the great advantage of enabling the passengers to alight at once from the carriage to the ground without the intervention of platforms is no small recommendation, but that its great security must eventually compel all the railroad companies to avail themselves of this invention, inasmuch as it will be found, not only economical to the companies in question, but the effect upon the public, by ensuring to them a degree of security unattainable by any other form of carriage, or by any other mode of conveyance, must be such as must materially enhance the value of their property, and the interests of the system of railways generally.

EXPLANATION OF PLATE.

a b c are the low bodies; *d e* the upper bodies, which may be second class carriages; *f g h* luggage holds; *i k* steps for the upper bodies.

1, Stafford Street, Bond Street. W. J. CURTIS.

Public Works of Great Britain. Edited by F. W. SIMMS, C. E. London: John Weale. 1838.

We have received, too late for a minute review, a copy of this important work, which we shall fully notice hereafter. From a general inspection of its contents, and the style of its execution, we are led to conclude that it will be found to be of great utility to the practitioner as a book of reference, and to the student in maturing his judgment. The first division of the work consists of the principal engineering works on most of the important lines of railway. The plates, which are all executed in the first style of the art, are stated to be accurate reduced copies of the original working drawings, lent for the purpose by the engineers who designed the respective works represented; and the letter-press consists of general descriptions and copies of the original specifications. A great part of this portion of the work is devoted to the London and Birmingham Railway, representing the principal works on the line, accompanied with copies of the specifications. We ought not to omit to notice the enlarged plates of that important part of the work, the cuttings and undersetting of the rock at Blisworth, in Northamptonshire. These plates, together with the whole of the working section, have been given of the full size of the original; and,

together with the specification annexed thereto, give an excellent idea of the magnitude of this undertaking. Besides the Birmingham Line of Railway, there is also a notice of the Great Western Railway, with five plates, containing copies of the working drawings of the Brent Viaduct, and of the Bridge over the Thames at Maidenhead. Then follows the Southampton, the Greenwich, the Croydon, the Thames Junction, and the Glasgow and Garnkirk Railways; also particulars and specification of rails, chairs, turn-plates, and sidings or passing-places. And, lastly, this division of the work concludes with the particulars of locomotive engines, and a specification of Mr. Stephenson's patent six-wheeled locomotive engine and tender, accompanied with a very beautifully executed engraving.

The second division contains canals, docks, lock and quay walls, both in stone and by the modern method of cast-iron piling—bridges, &c., of which, from their importance, we must defer further notice till we have had time to examine them minutely. The same observations must apply to the divisions three and four, the former being devoted to turnpike-roads, iron, steel, and gas-works; and the latter contains an historical and scientific survey and description of the Docks and Port of London.

Of this work, as a whole, it appears to us to be of a very important and valuable character; and, considered in comparison with the published price, is almost a gift to the public.

CAST-IRON BEARERS.

Extracts from a Paper on the Relative Strength of Several Cast-Iron Bearers when subjected to a Transverse Strain. By Charles Parker, Esq., *Fellow, read before the Royal Institution of British Architects, Jan.* 15, 1837.

The object of the paper was to give the results of a series of thirty-four experiments made by Mr. Parker, in an attempt to compare with one another the relative strengths of several forms of cast-iron beams when subjected to a transverse strain: also to ascertain the difference in the strength of their sections when close and when open or pierced, and to give some memoranda of girders that have been executed.

The following comprise the description of beams experimented on by Mr. Parker to obtain the requisite data:—

Complete and open rectangular section—Complete rectangular section with webs in the middle—Complete and open rectangular section with web on upper edge—Complete and open rectangular section with web on lower edge—Complete and open rectangular section with web on both edges—Complete and open rectangular section with spaces between the webs filled in solid.

The experiments were made on models of sufficiently large scale to allow of that precision in adjustment which is essential to obtain an accurate result. The length of each model when cast was two feet five inches and a half, and the depth was one inch and a quarter.

The principle on which the proportions of the sections were formed was to make the width of the complete rectangular beam the basis of every transverse section; consequently this same width is preserved throughout the whole of the several models in the narrow parts of the section, the webs being added in the proper places to make the required diversity of form. The depth and the length of the beam between the bearings in each of the examples were the same. The beams were supported horizontally at both ends, and strained by a force acting perpendicular at the middle point between the props. The quantity of deflection was multiplied by means of a lever index, and the pressure was continued three minutes before any addition was made to the weight. Four experiments were generally repeated of each section, and the strain was increased by fourteen pounds at a time till the beam was fractured. The proportions of the iron used in the castings were equal portions of hot blast calder iron and plate iron, taken from a cold blast cupola.

The following are the results of the experiments on the complete transverse sections:—*

		Wt. of Beam.	Breaking Wt.
		Ounces.	Pounds.
Complete Rectangular	A	28	375
Ditto with web in the middle	B	34	325
Ditto ditto on upper edge	C	34	325
Ditto ditto on lower edge	D	34	550
Ditto ditto on both edges	E	43	750
Ditto with space between webs on both edges filled in solid	F	90	950

It is not intended to illustrate the principle of comparison by any numerical operations, or to form constant multipliers applicable to the strength of each separate section. This remains to be done by future experimentalists, as it is considered that the results which have been obtained are insufficient for that object.

From a cursory inspection of the tables, the following deductions are obvious:—That the strength of a beam to resist a given pressure is not in proportion to the quantity of materials it contains; and, that the power of each section to resist the straining force is obtained more by the proper disposition of the component parts than by the contents of the sectional area.

On comparing the several results, it will be perceived that the strongest form is obtained by the relation that subsists among the parts that make the section E, in which the neutral plane is disregarded, and the surfaces of extension and compression are proportionally increased.

Also in the sections B, C, and D, in which the three planes of the area of a beam are severally enlarged, it appears that the increase of material can be applied with advantage only in the lower surfaces subjected to extension; for, when added in the neutral plane, or on the upper and compressed surfaces, it essentially weakens the beam, and renders its powers of resistance inferior to the plain rectangular section A.

The truth of this conclusion is equally deducible from the proportional increase of the deflections with the earlier weights, in those sections where the lower surfaces are not enlarged. It was perceptible also by the shape and appearance the parts presented where fractured. The whole of the results thus obtained seemed to indicate, that the resistance of the particles to extension is not the same, or equal to the resistance to compression; and on this principle it is suggested that the strongest and most economical section would be obtained by making the upper about half the projection of the lower web.

It is also observable, that the sections A and F, although both rectangular sections, and the latter in the model made three times the breadth of the former, do not preserve the same relative powers of resistance, the section F, with $3\frac{1}{4}$ times the material supporting only $2\frac{1}{2}$ times the pressure; this result makes caution requisite in the use of the tables of the strength of beams that usually accompany works on this subject, wherein it is argued, that as a beam of an inch in breadth will bear a certain weight, so a piece five times in breadth will be five times as much, and the same as any other breadth, forgetting that in a beam of a certain quantity of material, the maximum of strength is obtained by a certain ratio of the depth to the breadth.

The whole of the preceding experiments were made with the middle portion of the section entire; but with a view of ascertaining whether the strength of the material would be essentially impaired by removing that portion of it which lies immediately contiguous to the neutral plane, or between the compressed and extended surfaces, several castings were experimented on. Still, before detailing these results, it appears desirable to give the particulars of two experiments that were made on hollow girders of an elliptical section.

1st Experiment.—Two girders 21 feet 2 inches long each; weight of No. 1, 13 cwt. 1 qr.; ditto of No. 2, 14 cwt. 14 lbs.; distance between the supports, 19 feet 8 inches; space between the two girders, 3 feet; loaded with pig-iron and equally distributed over the whole length: both castings being defective, they broke with the weight of fourteen and a half tons. The deflection in the centre was three-quarters of an inch under the pressure of ten tons. The fracture in both was two feet from the centre.

2d Experiment.—Two girders from the same pattern as above, being sound good castings; the same distance between the supports, and the same space between the girders; the load equally distributed as in the 1st experiment. Weight of 2 girders, 1 ton 8 cwt. 2 qrs.; ditto of each girder, 14 cwt. 1qr.: both broke under the weight of twenty-one tons exactly in the centre of each girder. The deflection in the centre of the last two, during the process of weighing, was 5 tons $\frac{1}{2}$ an inch, 10 tons 1 inch, 15 tons $1\frac{3}{8}$ of an inch, 20 tons $1\frac{3}{4}$ of an inch.

It is scarcely necessary to mention, that the principle of strength in this section is taken from nature, where it is beautifully exemplified in the bones of many animals, in the structure of birds, and in the stems of most plants; but the advantages the form offers are defeated by the

* By dividing the breaking weight in pounds by the weight of the beam in pounds, we obtain the following data as the proportional strength of each beam:—

		Wt. of Beam in Pounds.	Breaking Wt. in Pounds.	Proportional Strength.
Complete Rectangular	A	1·750	375	214
Ditto with webs in the middle	B	2·125	325	153
Ditto ditto on the upper edge	C	2·125	325	153
Ditto ditto on the lower edge	D	2·125	550	259
Ditto ditto on both edges	E	2·688	750	279
Ditto with space between the top and bottom webs on both sides filled in solid	F	5·625	950	172

—Editor.

difficulty of obtaining sound castings, where the length exceeds the distance given in the experiments, namely, twenty feet.

Mr. Parker states, that by taking away the parts about the axis, or hollowing the mass, slightly impairs its power to resist a transverse strain, while it produces a form of section that combines the least quantity of material with the greatest strength.

These two experiments therefore show, that, in the direction of the length, a portion of the neutral plane may be cut away without much injury to the strength of the beam, but as there is often a portion of the neutral plane removed in the direction of the breadth, the result of the experiments before adverted to remain to be mentioned.

Mr. Parker then proceeds to make some remarks on *open or pierced beams*. It has been generally considered, that in pierced beams, the disposition of the middle surfaces of the depth may be regulated by fancy; and that, provided sufficient diagonal and cross-ties are allowed to connect the upper and lower portions, and prevent irregular contraction in the metal, no strength can arise from the distribution of these parts. Leaving this question for future inquiry, it is necessary to mention, that the plan of opening the beams, which was followed throughout the whole of the models, was similar to that recommended by Tredgold. Thus, the rectangular section had five-eighths of the entire depth taken away, and the several remaining portions disposed so as to keep an equal bulk in every part. The apertures had both ends circular, and both sides parallel, with the outer edges, thus connecting and giving stability to the whole beam.

The object now sought, was whether beams, having a portion of the middle cast open, were as strong and stiff as when cast solid, and after many trials the following were the conclusions.*

That beams of equal depth and breadth when cast solid are stronger and stiffer than when cast open.

That equal weights produce equal proportional deflections in the same section, whether cast open or solid.

That the strength and stiffness of the solid to the open section is in exact proportion to the quantity of material used in each section, and which, in the present case, may be numerically expressed as one-third in favour of the solid.

Such are the results of the experimental researches made on this part of the subject, for which, from our prior view, we were little prepared. How far these effects might be modified by a different manner of opening the neutral plane, is matter of conjecture, and can only be determined by experiment. Indeed, from the constant assertions that had been previously made, we were imbued with the idea, that when a certain quantity of metal is cast into the form of a beam of a given depth, it was both stronger and stiffer if *pierced* than it would be if left *solid*. The results have proved this to be erroneous; and should it now be advanced on the ground that the equal quantity of metal, and not the equal depth of the two sections, are to be regarded, still, if found correct, it will not alter the general consequence that may be inferred from the experiments, namely, that into whatever forms the middle portion of the beams may be moulded, the advantage will be comparative, and there will be no deviation from the principle that has been found to operate in the hollow girders.

* We regret that Mr. Parker did not give the particulars of these experiments, as they are most important.—EDIT.

ARCHITECTURAL NOTATION.

SIR,—In your last Number, I find a paper upon *Architectural Notation*, read before the "*Institution of British Architects*," in which is a disquisition upon the adoption of a uniform method of Notation. It does not appear, that of the thirteen modes of notation therein instanced, any difficulty of understanding the intentions of the several writers has been experienced: of these methods, those of Messrs. Stuart, Wilkins, Pugin, Walker, and their associates, have one superiority, in no distinct denomination being set over the decimal parts of inches, which not being of a new *duo*-decimal denomination, it is inaccurate to give them any new denomination, the decimal point (·) explaining to the meanest arithmetician the true fractional value; for the marks (′·″·) or (⁰·′·″·) should, as in astronomy, signify gradual *equal* progression, as from degrees to minutes, from minutes to seconds, &c. The notations of Mr. Donaldson and his associates is, however, the best, for the reasons which I will hereafter show, but then the denomination (″) should be omitted, or, if it be retained, it should be applied to twelfths, and not to tenths of inches.

Although most persons who use duodecimal arithmetic multiply fractional dimensions principally by the rules of *Practice*, or subdivision, still it is very convenient for knowing how to place the several products of the fractional multiplications under their right denominations, and comparatively few persons, who use duodecimal arithmetic know how to do this, in the case of minute parts of inches when multiplied in the regular mode of duodecimals; and this may sometimes be of importance in estimating the weight of metals, and other costly substances. It is no new method to place over feet the mark (⁰), over inches that of (′), over parts or seconds that of (″), over thirds that of (‴), and so on; and this facility results;—for add together the numbers of the two denominations multiplied, and their sum will be the value of the product; thus, feet multiplied by inches will give inches, $({}^{0} + {}' = {}')$; and parts multiplied by parts, will give fourths $({}'' + {}'' = {}'''')$, as will be een by the following multiplication:—

0	′	″	‴	⁗
feet.	inches.	parts.		
1	2	1		
2	4	3		
		3	6	3
	4	8	4	
2	4	2		
2	9	3	10	3

Stuart's method of putting the mark (′) over feet, will confuse a person multiplying, and so will Donaldson's method of putting the mark (″) over tenths of inches. There should, I think, have been no changes introduced in the notation of the volumes in continuation of Stuart's invaluable work; changes too often create, with many persons, doubt and confusion: hitherto, the change in the French measures has caused more trouble and annoyance, both to Frenchmen and foreigners, than any good result will ever repay, besides rendering obsolete a very splendid portion of French scientific literature; while the French long measure, derived from the pendulum-rod, which varies in length in different latitudes, is a very unsatisfactory standard, even within the extent of France.

I am strongly of opinion, that these marks should be abandoned altogether, except in *duodecimal* arithmetic. The words "*feet*" and "*inches*," or their contractions "*ft.*" and "*ins.*," in order to prevent doubt, should always be expressed; and I judge, that no one who knows the superior convenience of decimals for summing up the fractional parts of dimensions, will think of carrying the duodecimal subdivision, in architectural plates, beyond inches; though I believe the mind, in considering fractional quantities, generally refers decimal fractions to halves, quarters, or other vulgar fractions, which are easily formed by bisection or other simple modes.

Yours, &c.,

Gray's Inn, January 20, 1838. ALFRED BARTHOLOMEW.

NEW INVENTIONS, &c.

SIR,—Being particularly devoted to the advancement of the arts, a true lover of novelty, and, moreover, a great rambler, with the organs of acquisitiveness and comparativeness, make me vain enough to imagine that I might be useful to many of your readers, by occasionally forwarding a few of my observations for insertion in your useful and valuable Journal; their tendency being of a practical nature, will, I am sure, be the more acceptable; as I clearly perceive your pages are occupied by articles of that character in preference to those of a more speculative nature. My purpose is a desire to distribute my mite of information to those that need it, and to seek the various novelties, inventions, and improvements that daily take place under our very noses (without our being a bit the wiser), and publish them to the world, or rather to your readers, and thus make myself useful in giving information of any peculiar kind of material, ornament, invention, construction, or what not, that may be discovered in and about the Metropolis, and consequently bring together the manufacturer and the consumer. Now, with regard to my calling, I have the honour of belonging to that profession to whose benefit your work is devoted, and consequently somewhat qualified to judge of the kind of information that is likely to be useful to them. I intend, therefore, if my proposal meets with approval, to visit the several manufactories, and describe, to the best of my ability, the nature, use, and advantages of their several productions. Having now informed your readers of my intentions, I am desirous of obtaining their aid and assistance, and wish that they will, at any time, inform me by letter under cover to your Office, when, where, and how such things that come within their notice may be seen or obtained, and I will immediately visit and report progress, that they may be reported in your future Numbers. I will now proceed to my task, and hope, ere another month elapses, to send you a "sample for approval," having, by running over your advertising columns, already noticed several inventions that deserve to be examined, and if good, to be made public. Yours, &c.

PHILO-TECHNICOS.

We shall be happy to hear from our Correspondent, and receive any letters that may be forwarded for him.—EDITOR.

GREAT WESTERN RAILWAY CARRIAGES.

SIR,—It is with much regret that I observe one particular in your description of the carriages built for the Great Western Railway. This is, that they are eight feet wide, from which it follows necessarily, that they must be mounted upon the top of small wheels, in a precisely similar manner to those on other railways. Thus, the only advantage to be derived from the increased gauge adopted by this Company, will be a wider base. *Some* improvement in the steadiness of the trains' motion will, no doubt, result from this, but surely not (at the high velocity contemplated) to the extent the public

have been led to expect. If, however, the bodies were let down to within a few inches of the ground, between wheels as large (at least) as the propellers, there would still be ample width, and how delightful, how beautifully imperceptible the gliding motion! Probably the expense would be greater, but surely it would be very false economy not to give the present important experiment every chance of success. For combined strength and elasticity, probably no wheels are so well adapted to the purpose as Jones's Suspension. I should think, too, that the evils of a "deep-cranked axle" might without much difficulty be avoided. My apology for troubling you with these remarks must be, that I speak on public grounds, not being in the most distant manner connected with the railway.

I remain, Sir, your obedient servant,

London, Jan. 13, 1838. Φιλο-Βεβαιωτης.

BUNNETT AND CORPE'S REVOLVING IRON SHUTTERS.

Sir,—I have frequently noticed in your valuable Journal advertisements respecting Messrs. Bunnett and Corpe's *Patent Revolving Iron Safety Shutters*; but not requiring any, I did not call at their office before yesterday, when I was pleased to find the several advantages stated by them generally borne out.

I feel perfectly satisfied in my own mind that the simplicity of their principle, and the nature of the materials are such, as to preclude the possibility of their getting out of order: the person in the office pointed out to me the very ingenious contrivance they have recently introduced to *prevent* servants *over winding the shutters* when *raising* or *lowering* them; he also informed me that they have introduced their iron shutters to *circular* windows, which, I must confess, appeared to me almost impossible; and I have no doubt that their ingenuity will be amply rewarded for the trouble and pains they must have taken in bringing their most excellent invention to such a state of perfection. I was also informed that great convenience was afforded by the application of their Patent Shutters to *Iron Fire-proof Safes* (a very large one at that time being in the office).

At one time I was fearful that Iron Shutters would never be brought into general use. I saw (what I considered) insurmountable difficulties, and that to effectually remove the liability to get out of order, to which that description of shutter appeared subject, would require more than ordinary labour and perseverance; but I have the pleasure to find my fears at once dissipated, and that some of the most eminent architects are giving every encouragement to the Patentees of the above shutters by introducing them in those buildings where great security combined with simplicity of action is required.

I should not have troubled you with this letter, was I not aware of the very great annoyance some of the Profession have experienced from having adopted other Iron Shutters, and in some instances been compelled to have them either removed or altered. Yours, &c.

January 24th, 1838. C. S.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

The Annual General Meeting of the Institution was held at their Rooms on Tuesday Evening, January 16, 1838, to receive and deliberate upon the Report of the Council on the state of the Institution, and for the Election of Officers for the ensuing year.

The following Gentlemen were elected Members of the Council for the year ensuing:—

James Walker, Esq., F.R.S., L. & E., President.

William Cubitt, Esq., F.R.S.
Bryan Donkin, Esq., F.R.S., F.R.A.S.
Joshua Field, Esq., F.R.S.
Henry R. Palmer, Esq., F.R.S.
} Vice-Presidents.

Francis Bramah, Esq.	George Lowe, Esq., F.R.S.
J. K. Brunel, Esq., F.R.S.	John Macneill, Esq., F.R.A.S.
William Carpmael, Esq.	W. A. Provis, Esq.
Lieutenant Denison, R.E.	James Simpson, Esq.
Joseph Locke, Esq.	Robert Stephenson, Esq.

A new Regulation and By-law was adopted for the introduction of a new class of Members denominated "Graduates," who shall be persons pursuing a course of study or employment in order to qualify themselves for following the profession of a Civil Engineer. A change has also been made in the constitution of the Council by the admission thereto of two additional members from the class of Associates, the Council having previously consisted of members of the first class only.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At an Ordinary Meeting, held 15th January, 1838, at the Rooms in Grosvenor street; P. F. Robinson, Esq., V.P., in the chair.

The following gentlemen were balloted for, and declared to be duly elected as fellows:—John Foulston, Esq., of Plymouth; Samuel Beazley, Esq.; of Soho-square.

Several donations were announced as having been received since the last Meeting:—Edward Edwards, Esq., Catalogue of medals struck in France, Signor Campanari, Copy of Essay by Signor Secondiano Campanari on the Fictile Vases found in Etruria; Joseph Bonomi, Esq., model of an obelisk near Cairo, with a description and impression in plaster of a medallion of Her Majesty, executed in the Egyptian style; J. Harrison, Esq., a very fine cast of the bust of the late Thomas Harrison, Architect of Chester; Mr. Willemint, a coloured print of the altar window at St. Peter's Church, Hampton Lucy, Warwickshire; H. E. Goodridge, fellow, three specimens of stone from Tisbury, Wiltshire; James W. Wild, associate, copies of works in Worcester and Lincoln Cathedrals, by his father, the late Mr. Charles Wild; G. Godwin, Jun., associate, Part 13 of the Churches of London, and several specimens of building stones and granite.

The following papers were read:—

On the Restoration of the Temple of Jupiter Olympius at Athens, illustrated by some beautiful drawings, by Charles E. A. Blair, Esq., Architect.

On the relative strength of cast iron beams when subjected to a transverse strain, being the result of a series of practical experiments, illustrated by the original models, by Charles Parker, fellow.

The following drawings, which had been sent in for the Soane medallion, were exhibited:—

Two series, being restorations of the Abbey of St. Mary, York; one ditto, being a restoration of Kirkstall Abbey, Yorkshire; one ditto, being a restoration of Llanthony Abbey, Monmouthshire. The paper accompanying one of the first subjects was read by P. F. Robinson, Esq., V.P., who made some preliminary observations and remarks connected with the Abbey.

ARCHITECTURAL SOCIETY,

35, LINCOLN'S-INN FIELDS.

The Monthly Meeting for the introduction of visitors was held at their Rooms, on Tuesday, January 2nd, 1838. George Mair, Esq., V.P. in the chair.

Letters were read from the Committee of the Travellers' Club, also from Charles Barry, Esq., Architect, expressing their consent and approbation to the student members measuring the Garden Front of the same, for the purpose of competing for the copy of Mr. Owen Jones' book, agreeable to the notice given at the last meeting. The election for two student members then took place, as also the balloting for the last subject agreeable to the premium to be given by George Mair, Esq., V.P. An interesting paper was then read by T. H. Wyatt, Esq., V.P., entitled "Considerations on the Commencement of an Architect's Practice."

The subject for the members' sketches was then announced, viz.—"A design for a nobleman's mansion in a public square, with stables in rear."

Students' subject—"Design for a gamekeeper's lodge, with plan, elevation, and section."

The Chairman then called the attention of the Meeting to Messrs. Fair and Baillie's Patent Glass Ventilator; also Messrs. Bunnett and Corpe's Patent Revolving Safety Shutters and Blinds, in iron and wood;* also iron fire proof Safes, by Messrs. Bunnett and Corpe, both of which were fully explained by the respective patentees.

Models were also exhibited for improvements in the construction of French Casement Sashes, so as entirely to exclude wind and weather.

Some interesting Prints of ancient Tessalated Pavement were exhibited by Mr. J. H. Hakewill, member.

Also several sketches by students, in competition for George Mair's prize.

MANCHESTER ARCHITECTURAL SOCIETY.

The first Annual Meeting of this Society was held in their rooms, Mosley-street, on Wednesday, January 3, the President, Richard Lane, Esq., in the chair. The Report of the council gave a very satisfactory account of the proceedings of the past year and a flattering statement of the prosperity of the Institution. The library now contains nearly 150 volumes of the best standard works on architecture; and the Royal Institute of British Architects in London have expressed a wish to open a correspondence, as well as offering admission to their meetings to any members who may visit London. Five new members were elected, after which the several officers were appointed for the year, and the thanks of the Meeting were presented to Mr. Lane, Mr. James Heywood, Mr. J. W. Frazer, and many other gentlemen who have made donations to the funds and library.

MEETINGS OF SCIENTIFIC SOCIETIES.

Institution of Civil Engineers, 1, Cannon-row, Westminster, every Tuesday Evening, at 8 o'clock.

Royal Institute of British Architects, 16, Grosvenor-street, Grosvenor-square, Monday Evening, 8 o'clock, February 12th and 26th.

Architectural Society, 35, Lincoln's-inn-fields, Tuesday, February 13th, at 8 o'clock.

Society of Arts, Adelphi, every Wednesday, 8 o'clock.

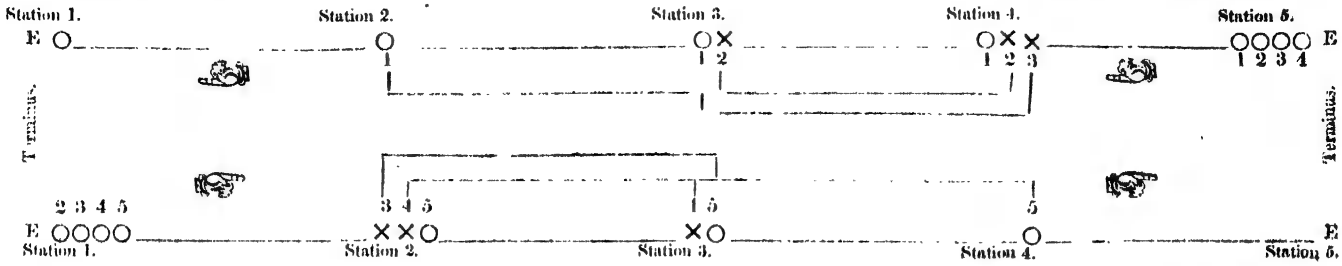
* These Iron Shutters are being very generally introduced in all the principal offices in the City; the advantages are very great, not only for their security against depredators and fire, but also for the convenient manner they may be closed from the interior in a few seconds, and concealed either in the entablature or over the soffit of the window.

LONDON AND BLACKWALL COMMERCIAL RAILWAY.

REMARKS ON THE REPORT OF MESSRS. G. STEPHENSON AND G. P. BIDDER. BY AN OLD ENGINEER.

SIR,—The Report of Messrs. Stephenson and Bidder to the Directors of the London and Blackwall Commercial Railway Company, on the best mode of working that line, has fallen under my notice, and as I do not concur in the view of the subject in question taken by those gentlemen, and as the decision of the Board must influence the interests of the shareholders in a very high degree, in the event of a wrong calculation being adopted, I make no further apology for requesting the insertion of this Letter into your Journal.

The subject matter for consideration is stated in the second paragraph of the Report.* The trains are assumed to start every quarter of an hour, during business hours, from each terminus, and for the remainder of the day, every half hour; the time occupied in each trip, it is proposed, should not exceed twelve minutes. The road proposed is set forth and explained in the Report (paragraphs 12, 13, 14, 15, 16). These portions of the Report place the question at once before the reader as it is, whether the locomotive or stationary engine, for a short and busy line, is the best of the two; it will, perhaps, assist us in understanding the argument to refer to the diagram below, which displays my view of Messrs. Stephenson and Bidder's plan.



The numbers 1, 2, 3, 4, 5, represent the termini, and OOO, intermediate stations; the letter E the engine stations, and the indexes (☞) the line of direction of the rope and train respectively; the letters O represent the trains, or carriages, destined for each station, and are numbered according to the station they will stop at. Thus, supposing the whole train of carriages to start at the same moment, the detached carriages will reach the termini successively, and the four conjoined carriages will be thrown off the ropes as they successively arrive at their places of destination: then, the return line will present the aspect of the second diagram, the same arrangements will take place, and the carriages will be left at the stations for the operation to be again repeated; by this means, the arrangement is simple enough, and the journey from terminus to terminus may be made in 12 minutes, and passengers taken up, and set down, between the termini and the intermediate stations. But suppose it is required, as stated in paragraph 20 of the Report, that passengers be taken up and set down at intermediate parts of the line, for example sake, between the West India Docks and Limehouse, or stations 4 and 3, or the West India Docks and Cannon Street Road, or stations 4 and 2, the distances between each place being a mile; then, auxiliary carriages must be provided, represented by ×, which must be thrown off the rope as they arrive at the stations to unload; and then, if only two lines are employed, these auxiliaries will be stationary upon the line, whilst the Blackwall train is travelling only a mile behind, at the rate of a mile in two and a half minutes: thus, unless the passengers alight and the carriage be again connected with the rope (running at the rate of twenty four miles per hour), a collision must take place; but, perhaps, the other side may propose to get out of this dilemma by taking the West India Dock passengers, requiring to be set down at Limehouse, to London, and then setting them down by the London return carriages, thus making it necessary to change coaches; and this could not be done by the return train, as the carriages do not stop near the engine, but are impelled by *momentum*, between the Minories and Fenchurch Street; so that, if a person set out from the West India Docks, it would take him a quarter of an hour to go to Fenchurch Street, and half an hour to get to Limehouse (losing one train), being conveyed by the railway a mile in three-quarters of an hour, about the time he could walk double the distance without the least difficulty. The only way then to get out of this dilemma, is to have four sidings or collateral lines for the auxiliaries to draw out of the main line; but then this is just the same as forming four lines, and neutralizes the proposed system altogether. More than this, the space which must be left in the diagonal rail for the rope to pass, must be replaced like a switch, before the carriage crosses over, which will be an arrangement very likely to be neglected, when the most disastrous consequences may result.

I hope I have thus shown that Messrs. Stephenson and Bidder cannot possibly carry into effect two of their proposed objects, viz.—take up and put down passengers between intermediate stations, without four lines of rails, and without losing time.

Let us now see how this object can be effected by the locomotive.

If a single train is employed from end to end, to stop and take up passengers at the various stations, then, of course, the time between the termini will be prolonged, but it need not be more than two minutes at each station, which would make it eighteen minutes for the whole line; but if it should prove that the West India Dock passengers were sufficiently numerous to warrant the arrangement, an engine could start from that point and take up the passengers as it went along, leaving the Blackwall trains to run the whole distance without stopping; neither will there be any collision here, for by the West India Dock's train, following the Blackwall train, all possibility of accident from this cause will be avoided; and thus the time between Blackwall and London may be twelve minutes, whilst the West India Docks and London will be fourteen minutes; and by refining still further upon this method, by a train starting from Limehouse to take up the intermediate passengers, and this train following the quick trains, the West India Dock train may run through in ten minutes, Blackwall in twelve minutes, and Limehouse in ten minutes, starting either after the West India Dock, and before or after the Blackwall trains; and all this may be done upon two lines without sidings or collateral lines. It is thus evident, that if it be an object to reduce the width of the viaduct, it can only be done (embracing all the objects of the Company) by employing locomotive and not stationary engines, in the manner proposed by Messrs. Stephenson and Bidder.

The method proposed, of working upon the same line backwards and forwards by a tail rope, has this very great disadvantage; that you are limited in the number of trains you can despatch from each end to the time occupied in travelling between the extremes; in the present case, the limit has been chosen, but an endless rope being employed up one line and down the other, and kept in perpetual motion, trains might have been sent off every minute, and it would only have been necessary to have provided for the case of the train starting gently, without stopping the rope in a manner similar to that practised every day in manufactories. By the locomotive system, each train being independent, acts upon the accommodating principle, so that the only limit, is the distance one train ought to keep from the other (half a mile), which would allow of trains starting every minute, as in the other case.

Aware of the objection against the pullies which support the rope from the noise produced throughout the line, these gentlemen state, that "the pullies for carrying the ropes admit of being constructed so that all inconvenience from this source would be entirely obviated; so that, indeed, the inhabitants adjoining the line would be utterly unconscious of their action. On the other hand, it is clear that the occasional nuisance arising from the expulsion of steam and ashes from the locomotive engine funnel would be totally avoided." This I doubt very much, even supposing some method contrived by which the noise from the axles may be prevented, the rapid revolution of the pulley itself would make such a humming noise as would prove "a just cause of complaint" to the inhabitants upon the line. Perhaps these gentlemen have never heard the whiz produced by a cannon-shot, or even a bullet through the air, produced from the mere friction of the air upon the surfaces of either; I have heard such repeatedly, and should be very sorry to inhabit a house in which such sounds were perpetual.

The steam and ashes from locomotives, if a source of annoyance, is the fault of the contriver or manager. Hancock has proved that a locomotive may be so quiet, that it shall make no more noise than a condensing engine; and as regards the nuisance of the engine blowing up, this is a fault of construction also, and a loss of power likewise, which might be very easily removed in the first case, and employed to a very useful purpose in the second.

The enlargement of the curves, so earnestly recommended, is needed more for the stationary than the locomotive system, because the locomotive can adapt its speed to all conditions of the ground it is going over; not so the stationary engine, which must be worked at an almost uniform velocity; and although Messrs. Stephenson and Bidder may fence off this objection by saying they will provide signals on the rope, or some system of adjustment upon the engine, each remedy is so very faulty, that I am certain both would fail in practice.

Again, as regards the chances and the nature of accidents to both systems, the locomotive is decidedly the most safe, supposing a broken rail, or a carriage thrown off the line; the stationary engine, two miles off, could never be stopped in time to prevent mischief, and it is not answering the case that the means may be provided to throw off the connexion of the train with the rope at a moment's notice; this may succeed in ninety-nine cases, but at the hundredth it may fail, and then the train would be dragged along and

* We have omitted printing the passage of the Report, having in another part of our Journal given it in full, and have numbered the paragraphs, so that any part of it may be the easier referred to.—EDITOR.

dashed to atoms without remedy; the accident would assume the character of those awful cases, when a man's apron catches in a strap in the machinery of a manufactory, dragging him round the pullies, and tearing his body to pieces.

The locomotive, on the contrary, has provided within itself the same means of stopping or throwing off the power at will, and in the case of running off the line, the train will be very soon stopped by the resistance of the ballasting, and that by a comparatively insensible action, and the less dangerous consequences, under all the circumstances of the case, are likely to ensue.

There is no doubt that a fixed engine is more economical than a locomotive, as at present constructed; but I am very much mistaken if the difference will always exist, or even until the Blackwall Railway shall be formed. And I think Messrs. Stephenson and Bidder are not justified in taking credit for the abolition of the hoisting machinery at the West India Docks, inasmuch as their terminus being upon the same level at Fenchurch Street as the other plan, they are converting the entire line into a hoisting machine, and if my assumption is correct, no possible advantage can arise; for if the difference of level between the West India Docks and Fenchurch Street is the same in both plans, the power required to lift the load, or the momentum of the machine, must be the same, whether it is up the perpendicular, or along the diagonal of the triangle representing the two forces.

It is true, the Blackwall engine is less powerful than that at the Minories by 50 horses power, the difference in tractive force being made up by the inclination of the plane; but, unless the two engines are connected together, so that the weight of the waggons on one side balance that of the waggons on the other, the weight of the waggons towards London will be always acting disadvantageously, and the engines will lift every journey, towards London, the entire train of coaches, waggons, and passengers, a vertical height equal to the difference of level of the two termini: now, by the hoisting machinery, the goods only are lifted up this difference, the passengers lift themselves, so that the loss of power would be comparatively immense on the side of the proposed system. Again, a judicious engineer would always, if possible, give the inclination of his line in favour of the heaviest load. London being the great consumer,* the provisions and goods coming towards London will be very much greater than the provisions and goods going from London, particularly the goods imported into the docks, such as the heavy articles, sugar, logwood, iron, stone, &c.; thus, in this view of the case, the alteration or lowering the levels towards Blackwall very ill-advised.

I am surprised, that an engineer who has had the very extensive experience that Mr. George Stephenson has had, should depart in this instance from the evident principle, which I can scarcely think he has not observed, that the word power, as applied to a railway, refers rather to its levels than its engines, and that this point ought never to be lost sight of. He cannot fail to have observed, that the inclined planes of the Liverpool and Manchester Railway cause greater wear and tear to engines, and greater comparative expense in working, than all the rest of the line put together; but, in this instance, he rejects the level of 12 feet per mile, and refers to the Euston Square plane of 80 feet per mile, as a favourable illustration of the principle he advocates, and for no other reason but because of the superior advantages of the stationary over the locomotive engine, as a mere machine.

The Directors, in the preliminary paper accompanying the Report, make the following observations:—"The Report which accompanies this, is the result of that application; and, while the Directors congratulate the Proprietors upon its very important and satisfactory contents, they are enabled to state, that no Report was ever prepared with greater consideration, anxiety, and labour, and they therefore confidently recommend it to the adoption of the Proprietors."

I think, if my position cannot be disproved, the Directors have little ground for their expressed congratulations. In my judgment, a great question has never been more unfortunately treated; and I would earnestly recommend the parties interested, to subject all the points stated to their most serious deliberation, for if they should act upon this Report, I fear they will have but too much reason to regret their decision.

One word, in conclusion, upon the paragraph respecting the comparative success or otherwise of the Greenwich Railway. That Railway has never had justice done to it, either by the public or the Directors; the management hitherto has been most defective; the engines upon the line, excepting two by Forrester, of Liverpool, are very inferior; but notwithstanding these disadvantages, with only four engines on Easter Monday of the last year, 23,000 passengers were carried in one day, and without a single accident, in the teeth of the most defective arrangements. There has been nothing but a perpetual series of alterations in the operations; and there is not, at this moment, any person in charge of the mechanical department, qualified by experience or talent to so important an office; it is to be hoped that the new Board of Directors will, by their judicious measures (and they have made a few very proper dismissals), place, in a true light, a work, which ought, and might be, a pattern to all other undertakings of a similar nature.

AN OLD ENGINEER.

LONDON AND BLACKWALL COMMERCIAL RAILWAY.

REPORT OF MESSRS. STEPHENSON AND BIDDER.

1. Gentlemen,—In pursuance of your resolution, that we should furnish the Board with a written Report as to the best mode of working the Blackwall Railway, and point out any improvement that might occur to us in the construction thereof, we have examined the plans and sections of the London and Blackwall Railway, and have also had various communications with Mr. Tite respecting the property on and adjoining the railway: and we avail ourselves of this opportunity of expressing our thanks for the obliging manner with which he has given us much useful information.

2. With reference to the most important point on which you have done us the honour to request our opinion, viz.—the best mode of working your line of railway, we have to observe, that our attention has been devoted exclusively to the relative advantages of employing stationary or locomotive power; deeming one or the other of those to be the only practicable and efficient mode of working this line.

3. The Commercial Railway, as at present designed, is to extend from the Brunswick Wharf, Blackwall, to a depôt adjoining Fenchurch Street, in London, a distance of about three and a half miles, to be built on arches, and having gradients rising on an average twelve feet per mile; the line being tolerably direct, though there are, in its course, curves of about one thousand yards radius.

4. By the Company's prospectus, we find that the expected traffic is estimated at 13,500 passengers and 480 tons of goods per diem.

5. With the view, however, of keeping our conclusions upon the comparative powers of stationary and locomotive engines on the safe side, we have assumed the traffic at 8,000 passengers and 250 tons of goods per diem.

6. It must not be inferred from this, that we imagine the former statement of traffic to be exaggerated; our intention in the reduction being solely to prove the superiority of the stationary engine system upon the lesser amount of traffic, and *à fortiori*, demonstrate its greater eligibility for the larger quantity.

7. For this amount of traffic, and to meet the public convenience, we assume that it will be necessary to have trains to start from each terminus every quarter of an hour, during the business part of the day; and that for the remainder, it will be sufficient to have half hour trains.

8. We also assume the importance of the West India Dock traffic, both for passengers and goods, to be such, that it must be deemed a *sine qua non*, that the West India Dock passengers should be conveyed with the same regularity and speed as those passing from terminus to terminus.

9. Rapidity of conveyance being the chief inducement for the use of railways, we consider that the time occupied on this railway, from terminus to terminus, should not exceed twelve minutes. This, if the locomotive system be adopted, would require the engines and trains to travel with a minimum velocity of thirty miles per hour, when at full speed; otherwise the delay occasioned by the necessity of stopping at the West India Docks, would prevent the journey from being performed within the above limit. At this great speed, it is highly desirable that no curve on the line should be of less than one mile radius. There can be but one opinion of the manifest advantages which would follow the enlargement of the curves on your line of railway; and we are aware that they have been adopted for the purpose of avoiding greater interference with valuable property; if, however, the width of the railway be reduced to the extent we shall suggest, these curves may be got rid of without rendering such interference necessary.

10. We are aware that a highly respectable authority has stated that three lines might be sufficient upon the locomotive system; but it was added, that the width between the rails should be increased. We do not see how the increasing the width between the rails is to meet the necessities of the case; but are satisfied that it would then inevitably become still more desirable to have the curves of enlarged radii.

11. Mr Cubitt having, therefore, notwithstanding his proposal to reduce the number of lines, still recommended a width of forty-five feet for the railway, being, in fact, the same as that chosen by Sir John Rennie, and estimated for by him, we have assumed this width in our estimates for the locomotive system.*

12. If the stationary engine system be adopted, we should recommend that the engines be placed at or near to the Minories in London, and at or near to Brunswick Street, at Poplar, with ropes extending between these two points; leaving the spaces included between the Minories and Fenchurch Street, at one end, and between the Brunswick Wharf and Brunswick Street, at the other (which are composed of curves of small radii), to be worked in one direction by momentum and in the other by gravity, as at present exemplified in the London and Birmingham Railway, at Euston Square.

13. The ropes would be wound round drums of a large diameter, and we should propose to work this line by what is called a tail rope; that is, a rope attached to the train, by which it is drawn on the return journey, thus, in fact, a rope will be always extended the whole length of the line between the Minories and Brunswick Street, Poplar.

14. By this arrangement carriages can be attached or detached, at any intermediate point of the line as well as at the termini, upon the same principle that the trains on the London and Birmingham Railway are attached to the rope on the extension of that Railway to Euston Square.

15. Capability would thus be afforded to the Company of increasing their intermediate stations, when their depôt establishment is properly organized, and sufficient inducement in point of traffic has been ascertained to render it desirable. By means of the stationary engines and ropes disposed in the way before specified, the taking on carriages of goods and passengers at all such points as may hereafter be determined upon, can be effected without any stoppage of the intercourse between the extremities of the railway; and the extreme velocity of the rope, therefore, need not exceed twenty-five miles per hour, in order to perform the journey in twelve minutes. The practicability of attaining this velocity, is already proved by the experience of the London and Birmingham stationary engine plane, where a gradient of eighty feet per mile, and with two engines of only sixty-horse power each, is travelled at a speed of twenty miles per hour; and, as the gradients on this railway would be very considerably less, the speed could, as a matter of course, be proportionably increased.

16. Upon this system there would be no necessity for more than two lines of rails; and if the previously assumed space were taken for the lines, the width would not exceed twenty-two feet; but we are of opinion that a greater width should be taken for two lines, and we have assumed twenty-nine feet to be essential, and have made our calculations thereon.

17. Having made these introductory remarks, we shall proceed to the comparison of

* By the evidence given before the Committee of the House of Commons, session 1836, the quantity of goods delivered by land *out* of the East and West India Docks *for* London, is 1[illegible],737 tons; and the quantity of goods delivered by land *from* London *to* the East and West India Docks is 18,638 tons.

* On reference to Mr. Tite's evidence, we find that his estimate of the proposed extension to Fenchurch Street applies to a width of viaduct of 40 feet to include three lines of rails only, and these of the width of 5 feet. On consideration, however, that the orginal estimates apply to that part of the line between the Minories and Blackwall, on which portion only we have estimated the saving effected by adopting the stationary-engine system and being of opinion that four lines of railway would be found necessary were locomotive power resorted to, we do not think it would be fair to state the saving in the width of the viaduct at less than 16 feet.

the relative merits of the stationary and locomotive systems, as applied to this railway. To render our observations the more distinct, we shall arrange them under the following heads:—

1st, *Relative Speed;* 2nd, *Relative Working Expenses;* 3rd, *Relative Cost of Construction.*

I. Relative Speed.

18. As an abstract question, each system can give any velocity which the public wants can demand. In the present instance, we have assumed that it is essential that the trip from Blackwall to London should be performed in twelve minutes, and that the trips should be repeated every quarter of an hour from each end. By the stationary engine system, with engines of two hundred and fifty-horse power at the Minories, and of two hundred horse power at Blackwall, this can be accompanied with a train of one hundred and thirty tons gross load, or with a train of one thousand passengers; and this load might be materially increased, without prolonging the journey more than one or two minutes at most.

19. Upon the locomotive system (supposing that, to ensure regularity, the same speed and punctuality will be demanded in each direction), the capability of the engines is necessarily limited to the loads they can draw from Blackwall to London; which, it is to be observed, is against an inclination of twelve feet per mile; and our opinion is, that the extreme load to be attached to the locomotive engine to admit of its performing the trip in twelve minutes, should not exceed thirty-five tons gross, or two hundred and fifty passengers.

20. To provide, therefore, as well for those cases, when so many as one thousand or more passengers will have to be conveyed on one journey, as for the accommodation of passengers requiring to be taken up and set down at intermediate parts of the line, (which could only be accomplished by separate sets of rails devoted to that traffic and the carriage of goods,) it would, in our opinion, be absolutely necessary, that if it is to be worked by locomotive power, the railway should be constructed with four lines of rails; whereas, by the use of stationary engines, two lines would be amply sufficient to meet all possible exigencies. Undoubtedly there may be occasions when a variety of favourable circumstances will combine to permit the above load for locomotive engines to be slightly increased; but, on the other hand, it will more frequently happen that it will require to be reduced in a much greater degree. From such fluctuations, the stationary engine system is almost, if not wholly, free.

21. Neither system is exposed to serious derangements: though even on this head, in our opinion, the advantage, slight as it is, will remain with the stationary engines.

II. Relative Working Expenses, and Primary Cost of Establishment.

22. With a view to determine this important question, we have made use of the experience afforded by railways in operation wherever such information is available; and though there is not any railway strictly analogous to the London and Blackwall, we have applied the results of such experience, allowing for variation of circumstances, and the peculiarities of the case under consideration.

23. The calculations made upon these data have satisfactorily proved, that the annual expense of maintaining and repairing the locomotive engines required for this line, and keeping them at work, would amount to 23,000*l.* per annum; whilst the stationary engines would be worked and maintained for 11,000*l.*; to which must be added, 1000*l.* per annum for replacing the ropes. To uphold the railway, and to keep the permanent way in repair for the use of stationary engines, would cost 1500*l.* per annum less than if locomotive engines were used, making a total difference in favour of stationary engines, of 12,500*l.* per annum.

24. To establish the stationary engines with the requisite buildings and duplicates would require 25,000*l.*; and to purchase ten powerful locomotive engines, with the requisite water stations, repairing sheds, &c., would cost 20,000*l.*, to which latter sum should be added the expense of erecting the hoisting machinery at the West India Docks; and the annual cost of working the same should also be added to the difference in favour of the stationary engine system, under the head of working expense.

III.—Relative Cost of Construction of Viaduct and Railway required by the respective Systems

25. Prior to entering on the investigation of this head of comparison, we shall allude briefly to the peculiarities of each system which affect the costs of construction.

26. The locomotive engines require that, whatever may be the attendant expense, the gradients should be so modified and reduced as to admit of their efficient operation, otherwise the utility of these machines must be greatly diminished, and their working expenses augmented; whereas, the stationary engine system admits of the gradients being modified to a considerable extent, without affecting its useful and efficient operation. As an instance, we may again refer to the London and Birmingham Railway extension, on which there is a gradient of eighty feet per mile.

27. In the present case, the only limit to the most economical modification of the levels of the railway for adaptation to the stationary engine system, is the prescribed mode of crossing streets and roads. But even within this limit, the saving would be most important, and would be accompanied by other advantages hereafter adverted to: this saving would be increased, if permission could be obtained to cross under instead of over (as at present proposed) Brunswick-street, Poplar, and the road east of the West India Dock Company's reservoir.

28. A most important saving in the cost of construction will attend that system which requires fewest lines of rails, and consequently the least width of viaduct; and assuming that the views previously taken in this Report are correct, it would appear that two lines are all that are required by the stationary engine system; whilst the locomotive system renders four lines essential; and that therefore a saving of at least sixteen feet in the width of the viaduct would be effected by the use of stationary engines.

29. The saving thus attained, by narrowing the width of the viaduct, and lowering it as far as the powers of your Act of Parliament permit, would amount to 150,000*l.*; to which, if the before-mentioned thoroughfares are permitted to be slightly raised, would be added 23,000*l.*, making a total saving of 173,000*l.*, exclusive of that effected in the cost of the property to be purchased.

30. We would further observe, that if the works were so materially reduced, the whole could be completed in eighteen months.

31. Summary.—We thus collect that, under the three important heads of speed, working expenses, and cost of construction, the stationary engine system is capable of producing equal speed with the locomotive; whilst the stationary engine system admits of being worked at a charge of 12,500*l.* less per annum than the locomotives, and in construction a saving of 145,000*l.* would be effected within the powers conferred by your Act of Parliament, besides the saving in the cost of the property to be purchased, and also exclusive of the expense of erecting and working the hoisting machinery at the West India Docks; and that, provided the Company obtain the privilege of passing under the West India Dock Road East, and Brunswick-street, Poplar, a total saving of 108,000*l.* would be effected, exclusive of the expense of erecting and working additional hoisting apparatus at Blackwall, as well as of the less cost of property required.

32. Next, that in addition to the decided advantages attending the stationary engine system on the above important heads of comparison, it would also afford the means of providing as many intermediate stations as might be found requisite, and thus occasion an increase of traffic to the railway, and consequently an increase of accommodation to the public.

33. That, moreover, by being on a lower level at the West India Docks and Blackwall, it admits of a readier communication with the warehouses of the former, as well as with any additional wharfs which may be constructed towards the West India Dock entrance at the latter. In fact, it admits of goods being placed into waggons at the West India Docks, and removed to London, nay, to the warehouses of this Dock Company, in London, without transhipment and without the intervention of any cumbrous machinery whatever

34. Before concluding this report, we would add a few general observations, with a view of dispelling some misapprehensions which may exist respecting the introduction of stationary power.

35. It has been supposed by many, that great speed is incompatible with stationary engines and ropes. To this we would reply, that it is impossible to adduce a single fact or reason for this supposition; and, as conclusive testimony, we would once more refer to the stationary engines on the London and Birmingham Railway; which, with the unfavourable gradient of 80 feet per mile, yet produce a velocity of twenty miles per hour; and had the engines been of greater power, this speed would be proportionably increased. It has been stated, that the noise attending stationary engines is greater than that of locomotives; because, whilst in operation, the noise is maintained constantly throughout the whole line as far as the ropes extend; whereas, it is alleged, that the locomotives are only heard whilst passing. In reply to this, we can only express our decided conviction, that when it shall become an object, as it would in this case, to obviate all just cause of complaint, the pullies for carrying the ropes admit of being constructed, so that all inconvenience from this source would be entirely obviated; so that, indeed, the inhabitants adjoining the line would be utterly unconscious of their action. On the other hand, it is clear that the occasional nuisance, arising from the expulsion of steam and ashes from the locomotive engine funnel would be totally avoided. But we must go further and observe, that the greatest complaints occur against railways when their stations are situated in a crowded neighbourhood, and are produced by the steam blowing off whilst the engines are waiting for the trains, and from the whistles they blow as signals of their approach; whilst the stationary engines cannot be heard out of the building wherein they are erected As an instance, at Camden Town Station, you may actually stand immediately over the engines while in full work, and yet be ignorant of their vicinity.

36. Looking to these circumstances, and collecting that, by the plan proposed there will not be any of the machinery or ropes nearer the London terminus than the Minories, it seems clear that the clause in your Act of Parliament, requiring you to buy all property lying within fifty feet of your line, if injury can be proved, could never come into operation, as there would not exist any just cause of complaint.

37. In conclusion, gentlemen, we beg to recommend, for your adoption, the stationary engine system; under the certain conviction, that you would thereby accomplish your object in the most efficient manner, and with the utmost economy, both as respects cost of construction and working expenses.

We have the honour to be, gentlemen, your most obedient servants,

January 6th, 1838.

GEO. STEPHENSON,
G. P. BIDDER.

THE GRAND CALEDONIAN JUNCTION RAILWAY.

As this subject is at the present time exciting a powerful degree of interest, especially amongst our northern friends, we have much pleasure in laying before our readers Mr. George Stephenson's Report and observations on the route and merits of the two proposed Lines; Mr. Locke being also engaged to find a line to unite the Southern Main Trunks with Scotland

MR. STEPHENSON'S REPORT

TO THE WHITEHAVEN COMMITTEE OF THE CALEDONIAN JUNCTION RAILWAY.

Gentlemen,—In compliance with my instructions from the Caledonian Railway Committee of the 1st of September, 1836, which at that time I was not able to fulfil owing to my numerous engagements, and also in compliance with the request of the Whitehaven, Workington, and Maryport Railway Committee of the 6th of June, 1837, that I should make an ocular Survey of the Country between Lancaster and Carlisle, by Ulverston and Whitehaven; and also between Lancaster and Carlisle, by Kirkby Lonsdale and Penrith, with a view of completing a Railway Communication between Edinburgh, Glasgow, and London, on the western side of the island, and that I should report to you my opinion as to the practicability of the two routes, and which I would recommend should be adopted as the best line for the promoters and the public.

I have now to report to you, that I commenced my survey from Lancaster on the 1st of August, 1837, and proceeded to Poulton, and round the Bay of Morecambe, by Silverdale, Cartmel, and the point of Humphrey Head, across the Ulverston Sands to Ulverston.

I afterwards examined the peninsula between Morecambe Bay and the Duddon Sands. I then proceeded to examine the Lakes of Windermere and Coniston, to see if it were practicable to obtain a line in that direction, but I found no outlet at either place. I then proceeded from Ulverston, and crossed Duddon Sands at the High Ford, and travelled round Blackcombe by Bootle to Ravenglass, making a close examination of the coast in that quarter; and from thence by Drigg, Calder Bridge, St. Bees, and on to Whitehaven. I have also examined the different valleys presenting themselves by Egremont and Hensingham, and the country between them and Cockermouth.

I have already reported to you on the Line between Whitehaven and Maryport, from a Survey made by Mr. Hall, and after my examination of the country I have no hesitation in recommending it to you, as the best Line between Maryport and Whitehaven. And as an Act has already been obtained for a Railway between Maryport and Carlisle, the levels of which are known to be favourable, and the execution easy, it is unnecessary for me to enter into details on that point. The Company are making arrangements to proceed with the execution of the works.

From Carlisle I proceeded to examine the country southwards, and followed the course of the river Petril to Penrith, passing over Shap Fells, and thence into the valley of the river Lune, by Kirkby Lonsdale to Lancaster.

I will now lay before you the course the Railways ought to take through the country which I have examined, describing the routes of the Lines, with the merits and objections to each.

Commencing with the Coast Line at Lancaster, the Railroad should cross the river Lune on the west side of the town, and near the warehouses at present adjoining the river; it should then pursue its course through a very favourable country by Terrisholme, to near Poulton. This portion of the Line from Lancaster would be very nearly level.

At Poulton the sands commence, and the Line should proceed across them in a segment of a circle of about five miles radius, to Humphrey Head, from which place the most favourable course is across the Winder Moor marshes to Chapel Island, and forward to the mouth of the brook which runs down from Swarthdale to the coast, and following nearly the course of that brook, by Swarthdale and Pennington. From this point to Lancaster the country is nearly a dead level. From near Pennington to Kirby Ireleth the ground is rough, and deep cutting, with some tunnelling, would be required. This is a distance however of only two miles.

In these two miles iron mines are met with, which I think might be opened out with great advantage to the proprietors.

The Duddon Sands would then have to be crossed, the distance over which is a mile and three quarters.

From the Duddon Sands to near Bootle the Line runs along a valley about a mile from the shore, and parallel to it. From Bootle it runs in a direct line to Ravenglass, where it crosses a small bay running into the land, and proceeds between Drigg and the coast, in almost a direct line to St. Bees. A portion of this distance it runs almost along the beach where the sea is making land, and there is no danger of its washing. The Line, leaving St. Bees to the west, enters a beautiful valley which runs to Whitehaven, which town it ought to pass to the east of the Castle, cutting into the side of the hill sufficiently deep to hide it from the view of the Castle. It would then join the Line from Whitehaven to Maryport behind the Ropery. The Line I have been describing would run on almost a dead level from Lancaster to Maryport, and I believe in no part more than forty feet above the level of the sea. From Whitehaven to the Duddon Sands the cost of making the Railway would be much below the average of the general cost of Railways. The crossing of the sands would be the most expensive portion of the Line, but the quantity of land reclaimed from the sea would more than compensate for the expense incurred in crossing them.

I will make a few observations at the termination of this Report relative to the manner in which I would execute the works across the sands, and will now give you my opinion as to the direction of a Line from Lancaster to Carlisle, by way of Penrith.

Commencing at Carlisle, the ground is favourable along the valley of the river Petril as far as Penrith. At this town expensive and difficult ground begins to show itself. Two Lines present themselves here, one on the east and the other on the west side of the town. The east Line running near Clifton, by Melkinthorpe and Thrimby, to Shap; and the west Line following the course of the river Lowther, to near the same place.

Either of these Lines will be found very expensive. At Shap a very high country presents itself; the inclinations of a line through this country I have not been able to ascertain, but they must be very objectionable.

A little beyond Shap very difficult ground is approached, where a tunnel would be required, the length of which I could not ascertain, not having the levels of the country.

This tunnel would carry the Line into one of the branches of the river Lune, which falls very rapidly, and in a very serpentine course, and the ground rising to an immense height on each side, immediately from the bed of the river, would compel the Railway to be carried close upon the river side. Numerous crossings of the river would be necessary in order to make the curves passable, and points of the high land running to the river must be cut off. The winding course of the river and the high land abutting upon each side continue to near Sedbergh, where the ground assumes a more favourable character. The valley of the Lune here becomes very beautiful, and is studded with gentlemen's houses and mansions. From Sedbergh to Lancaster the ground is very favourable, but it appears to me impossible to carry the Line in the valley, on account of the numerous residences upon the banks of the stream; and if the valley be not pursued the whole way, the Line must be very expensive in its execution.

The next consideration is the merits and objections of the two routes.

As an act has been obtained for a Railway between Maryport and Carlisle, and plans are deposited in the Parliamentary offices for a Railway between Whitehaven and Maryport, I may suppose that these Lines will be made independently of any Railway from the South to Scotland, and that the local traffic is sufficient to make them pay. I therefore find, that by the Coast Line the number of miles of Railway to make for the purposes of a communication from Lancaster to Carlisle is, as nearly as I can measure from the map, about forty-nine miles and a half. This line would require that the Lancaster and Preston Railway should be deviated for two or three miles in approaching the town of Lancaster, or that two Lines should be made for a short distance at Lancaster. If two Lines are made, this distance would be increased to fifty-one miles and a half.

From Lancaster to Carlisle, by Kirkby Lonsdale and Penrith, would require, from the same measurement, sixty-six miles and a half of Railway, giving a distance of fifteen miles in favour of the West Coast Line.

The distance between Lancaster and Carlisle by the West Coast Line is eighty eight miles and three quarters; and by the Kirkby Lonsdale and Shap Line sixty six miles and a half, leaving in favour of the Shap Line twenty two miles and a quarter.

The next consideration is as to the working of the two Lines. If the Line by Shap Fells be about five hundred feet above the Coast Line, the merits of the two Lines would be nearly equal in point of time in travelling between Lancaster and Carlisle, providing the inclinations are such that the engines can travel upon them with facility.

There is a very serious consideration which has not heretofore been sufficiently regarded by companies projecting Railways over high countries, namely, the great length of the winters, the quantity of snow falling in highlands, and the length of time it remains upon the ground. These considerations, coupled with the effect produced by the ice upon the rails, in retarding the engines, will, in my opinion, be an insurmountable difficulty to the passing of the Shap ridge, especially as the inclinations at the summit must be steep. The snow posts erected on this ridge, to point out to travellers the course of the road when covered with snow, are a sufficient indication of the great severity of the winters. And as this Line would form the western thoroughfare between England and Scotland, it would be of the greatest importance that there should be no impediment which could prevent the engines travelling upon it at all times. My opinion is, that a Line across these hills would be interrupted by the severity of the winters for weeks together.

The Coast Line would be entirely free from this objection, owing to the lowness of its levels, and its proximity to the sea breeze, where neither frost nor snow are ever severe, and where snow almost immediately disappears from the ground.

It may be objected that the sea would occasionally break into the sands enclosed across the Bay, and wash away the Railway; this could not, however, take place if the structure were properly executed.

The Coast Line being almost a dead level, would form the most certain thoroughfare that could possibly be constructed, and might be travelled upon at all times, at almost any velocity, as it would be entirely free from sharp curves, which must be very frequent on the Shap Line.

As regards the local population, the Coast Line has also greatly the advantage, as it affords an immediate communication between the towns of Ulverston, Whitehaven, Workington, and Maryport to the south, and very convenient branches may be made to Kendal, Milnthorp, and Cockermouth; whereas I think the Shap Line only accommodates Kirkby Lonsdale and Penrith.

From the foregoing observations, you will perceive that I am inclined to favour the Coast Line, and I do so from the following considerations:—First, It will be very much cheaper to make, considering the land gained at Morecambe equal in value to the cost of gaining it; secondly, it does not interfere with ornamental property of any description; it accommodates a much larger population; it runs through a country almost perfectly level, and affords communication to many harbours along the coast, which must be of great importance to the country; it is free from objections in winter from the snow and ice; affords easy communication to several towns by branches; and it gives the MOST EXPEDITIOUS, CERTAIN, AND SAFE CONVEYANCE which can be obtained through this country.

It is true that the Shap Line has the advantage in point of distance, but when I take into consideration the difficulty of the country through which it would pass, the expense of construction, and the great height of the summit to be attained, it would be found to take more time in travelling upon it than the Coast Line, and with the other disadvantages it possesses, and feeling NOT THE SLIGHTEST DOUBT of the easy practicability of carrying the line across Morecambe Bay, I have no hesitation in expressing my decided conviction of the superiority of the Coast Line.

It appears to me, that the line of railway through the district I have described would be of such great importance to both England and Scotland, that it is well worthy the attention of Government in giving their assistance and support in its execution.—I am, gentlemen, your most obedient servant,

Alton Grange, Aug. 16, 1837. GEORGE STEPHENSON.

OBSERVATIONS ON MORECAMBE BAY.

The sands in this Bay appear to be composed almost entirely of calcareous matter, washed from the surrounding limestone district, and capable of being formed into the most fertile soil for agriculture. The sea has in many places receded, and left the sand nearly dry at high-water; where this is the case, the land is well grassed over, which I am informed it does very readily, and quite spontaneously; and from the specimens of the quality of land saved from the Bay, which I had an opportunity of seeing adjoining the beach, all doubt was removed from my mind as to the probable fertility of the soil, and its great value and benefit to the country, if it could by any means be preserved from the tide.

I will now give you some idea of the mode which I think ought to be adopted in fencing off the sea. I consider that it would be quite impossible to carry an embankment across these sands in the usual way to keep out the tide; for supposing it to commence on each side, keeping it the required height until the entrance into the Bay was considerably diminished, the efflux and reflux of the rivers and tides would be so great as to make it impossible for any embankment to be made capable of resisting the current.

I would commence by piling entirely across the Bay, at such intervals as I would consider necessary for protecting the foundation of the fence until it was finished. The fence should be commenced on the land side of the piles, taking about a foot in height at one time, across the whole Bay, with blocks of such a size as to withstand the sea. These blocks may easily be procured on both sides of the Bay. By the time one foot in height is carried across, a sufficient deposit on the land side would have taken place to fill up the height of the foot specified.

I would then go on, foot by foot, until the whole was accomplished; and the tide would flow over the fences as at present, until the Bay was filled up beyond the reach of the tides.

The whole of the water coming into the Bay from the rivers in floods, could not have any injurious effect upon the fence, as during the execution of the work the Bay itself would be converted into a lake, and the waters from the rivers would be equally dispersed over the whole, falling in a thin sheet of water over the weir, and would have no tendency to disturb the deposit on the land side of it.

The whole of the matter brought down by the rivers would have sufficient time to deposit itself in the Bay before the water could find its way into the sea, and in a very short time the Bay would fill up to high-water mark. There would also be a quantity of deposit left by each receding tide passing over the weir, until the top of the weir was above the reach of the tides.

I find that in the neighbourhood of Bootle, in Cumberland, the sea is making land for a considerable distance along the coast, without any artificial means. This material is formed from the soil which is brought down into the sea from the river in floods, but is of a very inferior description as compared with the material found in Morecambe Bay.

During the time the work would be going on, the channels of those rivers which now empty themselves into the Bay would be rendered innavigable; but when the work was completed, the rivers would be navigated much more advantageously than at present, for as soon as the Bay was silted up above high water, I would propose that channels for the rivers should be made on each side, with an outlet into the sea by arches; when no more water would flow in by the tide than the channels of the rivers could contain.

These rivers might be of great advantage to the land enclosed, as flood-gates might be put in, so as to allow the river to flow over the land in floods, and lay a fresh deposit on the Bay.

The line I have laid down across the Bay would reclaim about twenty thousand acres of land, but I think that forty thousand acres might easily be reclaimed; however, before I venture a strong opinion upon this point, I should like to have borings made at the place selected for crossing, in order to ascertain the nature of the substratum.

Considering one-half as a fair proportion of the expense of this embankment to be paid by the railway, and the remainder by the proprietors of the Bay, the latter

would be an excellent investment, and it would render the former a cheap work through that district.

It is a generally known fact, that very large tracts of land have been saved from the sea in Holland, and also on the eastern coast of England.

Alton Grange, August 16, 1837. GEORGE STEPHENSON.

GRAND JUNCTION RAILWAY.

On the 17th ult., an official report was made to the proprietors of the result of the first six months' operations. It appears, that during this period the business has been confined exclusively to carrying passengers and parcels; that the gross receipts have been £116,740. 10s. 7d. With respect to the arrivals in general, although it is acknowledged that there has been reason to regret many disappointments arising from various causes, some of which are removed, and others greatly diminished, it is considered on the whole satisfactory. Of 1600 first class trains, 1133 have kept time accurately; 1193 have not exceeded thirty minutes beyond the exact time, and including *all detentions whatever*, the average of the whole is only four hours forty-five minutes, which is considerably less than one half the time formerly occupied in performing the distance. Not a single fatal accident has occurred to any of the 282,202 passengers conveyed by this company since the opening; and in cases of accident, with the description of engine adopted on this line, the risk to passengers is said to be reduced to a degree hardly deserving of consideration. Although the receipts from travelling have declined during the winter quarter, the amount of business in this period has been steady and profitable, and the ratio of decrease is less than might have been expected, from the experience of other railways. The arrangement with the Post office for the conveyance of mails having been found, on trial, not to afford an adequate compensation for the service performed, a new agreement has lately been made, the terms of which increase considerably the revenue from this source. The accounts laid before the meeting exhibited a clear balance of profit to December 31st, 1837, of £56,035. 10s. 10d., which will afford a dividend of £5 per share, leaving a surplus of £1415. The net profit for Sunday travelling amounts to 6s. per share; and the directors recommend to the proprietors, that any shareholder who may refuse to receive it, shall be required to relinquish all claims to it afterwards, in order that it may be appropriated to charitable purposes.

PARLIAMENTARY PROCEEDINGS.

House of Commons.

Jan. 16.—Ribble Navigation.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 16.—Torquay Roads.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 16.—Montgomeryshire Western Branch Canal.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 16.—Brandling Junction Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 16.—Milton next Sittingborne Improvement Bill.—Read 2nd, and committed to Sir Edward Knatchbull and the Kent List.

Jan. 16.—Paington Harbour Bill.—Read 2nd, and committed to Sir John Yarde Buller and the Devon List.

Jan. 23.—Tenby Improvement and Harbour.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 23.—Manchester, Bolton, and Bury Canal, &c.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 23.—Brecon Market.—Report (15th December) from Select Committee on Standing Orders, read; Bill ordered to be brought in by Colonel Wood and Mr. Morgan.

Jan. 23. Private Bills.—Petition of the Chairman of a Meeting of Landholders, Commissioners of Supply, and Justices of the Peace of Aberdeen, for alteration of practice relative to the taking of Evidence upon Private Bills; to lie on the Table.

Jan. 23.—Private Bills. Resolved, "That no Private Bill be read a second time until six days after a Breviate thereof shall have been laid on the table of this House, and have been printed.

Resolved, "That such Breviate shall contain a statement of the object of the Bill, a summary of the proposed Enactments, and shall state any variation from the general Law which will be effected by the Bill.

Resolved, "That Mr Speaker be authorized to give such directions as shall seem to him best for carrying into effect the above Resolutions."

Jan. 25.—Gravesend Pier.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 25.—Eastern Counties Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Jan. 25.—Edinburgh and Glasgow Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

LAW PROCEEDINGS.—ROLLS COURT, JANUARY 13, 1838.

CALVERT *v.* THE LONDON DOCK COMPANY.

The Master of the Rolls gave judgment this morning in the case of Calvert *v.* The London Dock Company. The London Dock Company entered into an agreement with Mr. Streather, the builder, to make a new entrance to the docks, near Shadwell, for which they agreed to pay him £52,000 by instalments, the work being measured monthly, and two-thirds of the amount paid—the other third being retained by the company until the completion of the whole. The company, who had taken securities from certain persons to ensure the contractor's performance of his agreement, advanced to Streather monthly sums of money, far exceeding his claim for work done, without the cognizance of the securities. Streather became a bankrupt, and the Dock Company brought an action at law against his securities for the purpose of compelling them to pay the extra amount of expenditure incurred by them in the completion of the contract, and also the sums advanced beyond those due for the work actually done, and obtained a verdict of one shilling damages. Mr. Calvert and the other security applied to this court, upon the whole merits of the case, for an injunction restraining the company from taking out execution upon the judgment with respect to the costs. His lordship said, that under all the circumstances of the case, he was of opinion that the plaintiffs were entitled to have the injunction made perpetual, and to have the costs of this suit paid to them by the Dock Company.

At the Bucks Quarter Sessions, last week, the Earl of Orkney appealed against the order of the bench of magistrates in petty sessions, who had refused to compel the Great Western Railway Directors to build a larger culvert, or way for a water-course on the Earl's estate in Buckinghamshire, over which the line of railway passes. The counsel for Lord Orkney contended, that the smallness of the channel made by the company obstructed the ordinary flow of water to a mill belonging to his lordship, and contended that the culvert should be widened two feet. Mr. Talbot, for the Company, brought forward evidence denying the obstruction, and proving that Lord Orkney had received the immense remuneration of £300 an acre for his land, which was a full compensation for any trifling inconvenience he might suffer. The bench, after a patient hearing, quashed the appeal.—*Bucks Gazette.*

Compensation.—A jury was called to assess compensation to Mr. Gill, of Newcastle, for a small piece of land belonging to him, which is wanted by the Great Northern Railway Company. Mr. Gill claimed £11,000 as the value of the land, and the Company offered him £1,260. After hearing a great number of witnesses, the jury awarded the sum of £1,280 as a full compensation, being nearly £10,030 less than the claim!—*Tyne Mercury.*

Nuisances.—The Chief Justice of the Common Pleas, in giving judgment on a demurrer to a plea in an action for a nuisance, stated his opinion that every one had the common law right of wholesome air, and a plaintiff could not be deprived of that right because the person causing the nuisance had occupied his premises before the plaintiff came into the neighbourhood. The other judges concurred. The nuisance complained of in this instance consisted in defendant's carrying on the business of a candle-maker; he pleaded that he had carried on his business in the same place for three years, whilst the plaintiff had only recently come to the contiguous premises.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH DECEMBER, 1837, AND THE 25TH JANUARY, 1838, BOTH INCLUSIVE.

William Rutland Pzon, of Cambridge, for "Improvements applicable to Steam Engines."—4th January; 6 months.

Henry William Nunn, of Whippenham, Isle of Wight, Lace Manufacturer, for "Improvements in the manufacture, and in the making or producing of certain descriptions of Lace and other ornamental Fabrics."—4th January; 6 months.

Nathaniel Worsdell, of Crown street, Liverpool, Coach builder, for "Improvements in Apparatus to facilitate the conveyance of Mail Bags and other Parcels on Railways or Roads."—4th January; 6 months.

Bennet Woodcroft, of Mumps, Oldham, Lancaster, Gentleman, for "Improvements in the construction of Looms for weaving various sorts of Cloths, which Looms may be set in motion by any adequate power."—4th January; 6 months.

John Richardson, of Hutton, Yorkshire, for "Certain Improvements in the method of covering Buildings."—4th January; 6 months.

Charles Watt, of Manchester, Lecturer on Chemistry, and Thomas Rainforth Terrutt, of the same place, Merchant for "Certain Improvements in the manufacture of the Oxides of Lead, and also of the Carbonate of Lead."—5th January; 6 months.

William Wells, of Manchester, Machine maker, and Samuel Eccles, of the same place, Merchant, for "Certain Improvements in Power looms, and in Hand-looms, for weaving plain and figured Fabrics."—5th January; 6 months.

Charles Fitton, Woollen Manufacturer, and George Collier, Mechanic, both of Camberworth Hall, near Wakefield, York, for "Improvements in Power Looms."—5th January; 6 months.

John Thornhill, of Ison Green, Nottingham, Lace Maker, for "Improvements in the manufacture of Lace."—5th January; 6 months.

John Edwards, of Lincoln's inn Fields, Pen Maker, for "Improvements in Instruments used in Writing."—5th January; 6 months.

Hugh Ford Bacon, of Fen Drayton, Cambridge, Clerk, for "An improved Apparatus for regulating the flow or supply of Gas through pipes to Gas-burners, with a view to uniformity of supply."—5th January; 6 months.

William Southam, of Ditchford Mills, Nottingham, Miller, for an "Improved Apparatus or Machine for drying Corn and other Grains and Seeds."—5th January 6 months.

Charles Watt, of Manchester, Lecturer on Chemistry, and Thomas Rainforth Terrutt, of the same place, Merchant, for "Certain Improvements in the manufacture of the Hydrate and Carbonate of Soda from the Chloride of Sodium, applicable to the making of Soap, Glass, and other useful purposes."—5th January; 6 months.

Richard Bright, of Bruton Street, Berkeley Square, Lamp Manufacturer, for a "New or Improved Apparatus or contrivance for effecting the more complete combustion of Candles, and superseding the necessity of snuffing"—13th January; 6 months.

Edward Davy, of Fordton near Crediton, Devon, Merchant, for "Improvements in Saddles and Harness for Horses, and in Seats for Carriages."—13th January; 6 months.

Charles Barnard, of Norwich, Ironmonger, for an "Improved Mangle."—13th January, 2 months.

George Chapman, of Whitby, York, Engineer, for "Certain Improvements in Steam-engines."—13th January; 6 months.

Henry Hewitt, of No. 5, Stockwell Common, Surrey, Gent., for a "New or Improved chemical Compound or Medicine, to be used in the form of Pills, for the cure or amelioration of Sciatica, Rheumatism, and Gout, Lumbago, Ague, and other Diseases of a similar nature."—18th January; 6 months.

Julian Augustus Tarner, of No. 2, Henry Street, Liverpool, Architect, for an "Improved Method of propelling Vessels through water."—18th January; 6 months.

Luke Barton, of Arnold, Nottingham, Framesmith, for "Certain Improvements in Machinery for frame-work knitting."—20th January; 6 months.

Frederick Oldfield Ward, of Camberwell, Surrey, Medical Student, for an "Improvement or Improvements in Clothes and other Brushes."—20th January; 6 months.

Ambrose Ador, of Leicester Square, Middlesex, Chemist, for "Certain Improvements in producing or obtaining motive power."—20th January; 6 months.

Herbert George James, of Lower Thames Street, Wine Merchant, for an "Improvement in making Bread, being a communication from a foreigner residing abroad."—23rd January; 6 months.

Thomas Hancock, of Goswell Mews, Middlesex, Patent Water-proof Cloth Manufacturer, for "Improvements in the Method of Manufacturing or preparing Caout-

chouc, either alone or in combination with other substances."—23rd January; 6 months.

Robert Garton, of Beverly, York, Millwright, for "Improvements in Presses." 25th January; 6 months.

Francis Charles Parry, of Brompton, Middlesex, Esq., and Charles de Laveleye, of King's Head Court, London, Engineer, for "Improvements in the Manufacture of Bricks." 25th January; 6 months.

Charles Hancock, of Grosvenor Place, Hyde Park, Middlesex, Animal Painter, for "Certain Improved means of producing figured surfaces, sunk and in relief, and of printing therefrom; and also of Moulding, Stamping, and Embossing."—25th January; 6 months.

STEAM NAVIGATION

The largest steamer in her Majesty's navy is the *Gorgon*, recently built, being of 1,150 tons, builders' measurement. She will carry twenty days coals, one thousand troops, one hundred and fifty crew, with stores and provisions for all for six months. The engines are three hundred and twenty horse power, and the vessel is so constructed, that the steam machinery can scarcely be reached by shot.

Expenses of Steam Boats.—A steam-packet of 100 horse power, equipped as it ought to be, costs about 20,000*l.*; expenditure of fuel, wages, and victualling, about 250*l.* per month; tonnage duty, lights, pilotage, and port charges, 200*l.* per annum; insurance, 100*l.* per month, small repairs and winter expenses, about 500*l.* These items, with the expenses of boiler, which amounts to about 1,500*l.* in the ten years a vessel is calculated to last, and a reserve fund of about 2,000*l.* per annum for the construction of another vessel, makes altogether the sailing expense of such a vessel, about 1,000*l.* per month.—*Hull paper.*

Great Western Steam ship.—The important experiment which this fine vessel is destined to make, will soon be brought to the test. The *Great Western* is now in the Thames, receiving her engines, she will be ready for sea in March, and will take her departure from Bristol for New York early in April.

Another splendid Addition to the Steam vessels of Aberdeen.—We are glad to learn that the Aberdeen and London Steam Navigation Company have purchased the splendid and powerful steam vessel, *Duchess of Sutherland*, of Inverness. She is intended, we believe, for the London passage. The purchase price was 13,500*l.*, which is considered, by those qualified to judge of the value of the vessel, to be much within the mark. The original cost of the *Duchess of Sutherland* was upwards of 18,000*l.*, and having been only little more than a year at sea, she must be little worse of tear and wear. The *Duchess of Sutherland* was purchased first by a company in Inverness, for the Inverness and London trade; built by special contract by Robert Napier of Glasgow, and is considered to be the fastest going steamer from the east coast of Scotland. We had pleasure in adverting, in a late paper, to the very liberal manner in which the Aberdeen Steam Navigation Company have conducted their business; and the purchase of this splendid vessel is an additional proof of the great desire that spirited Company have to give every accommodation to the trade.

The removal of the Peninsular steam packets from Falmouth to Plymouth has caused considerable excitement at the former place. A meeting was held upon the subject last week, when a letter from their representative, the Solicitor General, was read, stating that the Admiralty had acceded to the new arrangement. Fears are there entertained, that this step will be followed by the removal of the West India packets to Plymouth also.

The *Semiramis* steam ship, bound for Bombay, passed this port (Plymouth) on the 5th of December, and put into Falmouth, where she remained a few days, and then proceeded on her voyage, which she expects to accomplish in 70 days, and for which, if performed within the stated time, she will receive a gratuity of 5,000*l.*—*United Service Journal.*

The expense of a steam vessel of 1,000 tons, and 300 horse power, built in London in the cheapest mode, with the most perfect machinery in present use, would be about 35,000*l.*—*Mr. Wm. Morgan's examination on India communication by Steam.*

Great American Steam Ship, Natchez, of 900 tons burthen, which is constructing under the direction of Captain W. W. Story, at the ship yard of Messrs. Rogers, Brown, and R. Colley, south side of the basin, is rapidly advancing to completion. This noble vessel is intended to ply between the cities of New York and Natchez.

American Law against Steam boat Accidents.—A bill has been introduced into the Senate, and committed to a large select committee. The following is a summary of the provisions. It provides, in the first place, that owners of all steam vessels shall register them before October next, and take out a new licence, under a penalty of 500 dollars. District judges of the United States are to appoint, on application of owners or captains, persons who shall inspect the vessels. The certificates are to contain a statement of the age, condition, and time during which the vessels have been running; also the amount of steam they are permitted to carry, and whether the machinery be fit for use and sound. A copy of each certificate to be delivered to the surveyor or collector of the port where application is made for a licence. The inspections are to take place at least once a year, and the boilers to be tested by a hydraulic pump every six months. In cases where boats stop while on a trip, captains are required to keep the machinery going sufficiently to work the pumps for supplying the boiler, and cause the safety valves to be opened so as to keep the steam at the same height as when in progress, under a penalty of 200 dollars for each failure to do so. Boats not exceeding 200 tons are required to carry two yawls, capable of containing twenty persons each, and those exceeding 200 tons to carry four yawls, of the same or greater size, under a penalty of 300 dollars. It is made the duty of every captain to provide his boat with a suction engine and hose, to be kept in good order, and carried during every trip. In ascending and descending rivers, it is made the duty of the master or pilot of the descending boat, to shut off the steam whenever she shall come within half a mile of any boat ascending, and to float up with the current, it being incumbent on the ascending boat to steer clear of the descending one, under pain of being liable for any damage that may occur. Every boat is to be provided with two lights, one three and the other ten feet above the upper deck, during all hours between sunset and sunrise. The penalties accruing under the act are to be recoverable in any District or Circuit Court of the district where the offence may have been committed, or the owner or captain may reside, one-half to the use of the informer, the other to the United States. Every captain, engineer, pilot, or other person employed in navigating any steam-boat, by whom misconduct, negligence, or inattention to his or their respective duties, the life or lives of any person or persons shall be destroyed, to be deemed guilty of manslaughter.

STEAM NAVIGATION IN TURKEY.

Constantinople, 24th Nov., 1837.

Comparatively speaking, until very recently, steam-vessels remained almost unknown in this country, although its waters and peculiar currents are so well adapted to develope the advantages of steam power. Within a very short period, however, a considerable number of steamers now frequent this port, and they are constantly increasing. The French Government steam-packets are appointed to arrive here every ten days from Marseilles, touching at Leghorn, Civita Vecchia, Malta, Syra, and Smyrna, and returning by the same route. They ought to perform the voyage between Marseilles and Constantinople in 13 days, but as yet they have not been very regular, and several accidents have happened.

The Trieste Lloyd's Commercial Company have established a line of steamers from that port to Constantinople twice a month, touching at Arrocona, Corfu, Patras, and Athens, returning by the same route. Another Austrian company, established at Vienna, make Constantinople their head-quarters, and possess several fine steamers, one of which they run between this port and Galatz; another to and from Trebizond; another to and from Smyrna; and a fourth to and from Salonica. The Russians have a steamer between this and Odessa. At present there are only three English steam vessels stationed here, viz., the Crescent, trading between Constantinople and Trebizond; the Essex, employed as a towing-vessel on the Bosphorus; and the Levant, formerly on the Smyrna station, but now employed on any service that may offer.* The Sultan does not at present possess a single steam vessel, but jealous possibly of his vassal, the Viceroy of Egypt's fine steam frigate, the Nile, which was here some time ago, he is now building two large ones in the arsenal, for which the engines are ordered in England. Twelve months ago the Porte possessed two old steamers, sent from England for sale on speculation three or four years previously, but as the Turks shockingly mismanaged and wore them out, the Sultan adopted a singular expedient of getting rid of them. He was graciously pleased to recommend (order) his Rayah, or Greek subjects, to form a company for steam navigation, to supersede the Ghiour, or Infidel companies; and in order that his subjects might commence operations without any delay, he liberally deprived his own navy of the only two steamers the government possessed, by selling them to his Greek subjects, himself fixing their price at 8,000*l.* for one, and 4,000*l.* for the other. In vain did the poor Greeks venture to urge that they knew nothing about steam vessels, and did not wish to embark in such an undertaking; remonstrate they dare not, and they bowed to the Sultan's decision. The company was formed—the purchase money (fixed by the seller) was produced, and the steamers were made over to the company. The result was as quick as it was disastrous. The very first voyage attempted by the largest steamer to Smyrna she was run on shore, and her boiler burst in attempting to get her off. The smaller one was then dispatched to tow the other back to Constantinople, where she has remained ever since perfectly useless. The next voyage attempted by the smaller steamer she was run on shore, and totally lost at the Dardanelles, with much specie on board. The greatest difficulty which steam navigation in this country has to contend with, is procuring respectable and efficient engineers, so many of whom unfortunately give way to excessive drinking, or prove to be ignorant of their duties. Another drawback is, the almost impossibility of getting any serious accident to the machinery repaired here; but the oldest established Austrian company have wisely guarded against this, by having formed their own factory at Smyrna, where they repair or refit their vessels. The average price of coals laid down here from England is 40s. per ton.—*United Service Gazette.*

PROGRESS OF RAILWAYS.

Brighton Railway.—There is every prospect of a commencement of this long disputed railway: the shares during the last month have risen from a nominal price to a premium, notwithstanding a call of 3*l.* per share has been made. A meeting of the shareholders was held on the 18th ultimo, when the Report of the Directors was unanimously adopted.

The Central Kentish Railway.—We were much surprised to hear that a line of country could be found through Kent for a railway, which can be constructed without a single tunnel, or inclination exceeding 1 in 306, and that for a very short distance; if this be the case, it will be a very formidable rival to the South-eastern Railway.

The London and Southampton Railway is rapidly proceeding towards completion, the line from the terminus at Nine Elms, through Kingston, nearly to Guildford, will be open to the public in May next, and from Winton to Southampton in the course of next summer. Contracts have been entered into for the buildings to be erected at the terminus at Nine Elms, under the direction of Mr. Tite, architect.

Lancaster and Preston Junction Railway.—Active operations are about to be commenced on this line, which is rather more than 20 miles in length; the works are to be divided into four contracts, to be executed under the direction of Joseph Locke, Esq.

Bolton and Preston Railway.—So far from the land between the surface, and through which it was intended to make a tunnel about 300 yards long for this line of railway to pass on the north of Chorley, being favourable for the purpose, it turns out to be all quicksand and filled with water. It is yet hoped that by taking it a little more to the north, a more favourable result may be the consequence.—*Preston Observer.*

North Union Railway Bridge.—Notwithstanding the frequent and harassing floods with which the contractors have had to contend, the second arch, from the north side of this magnificent structure, has been completed, and much progress has been made with the centres for the three remaining arches. The stone work is massy, and well put together, and its magnitude, beauty, and solidity, excite the admiration of all who see it.—*Ib.*

Newcastle on Tyne and North Shields Railway.—The commissioners under the North Shields Town Improvement Act have come to the determination of opposing, by every means in their power, the passing of the act for which the company have given notice of their intention to apply to Parliament during the present session, to enable them to extend the railway from the west end of Wellington Street, North Shields, to the village of Tynemouth. They say, that they conceive such extension would be "not only a most serious nuisance, obstruction, disturbance, and annoy-

* A new steam company has just been formed by the saraffs, or Armenian banker of Constantinople.

ance to the town generally, but entirely destructive of the value of property in the immediate locality of the proposed line." They have declared their intention to oppose the bill by counsel in Parliament.

There were no fewer than 21 candidates for the office of Resident Engineer to the Corporation of Newcastle, several of whom have very excellent testimonials as to character and ability.—*Tyne Mercury.*

A handsome locomotive engine, drawn by a team of sixteen horses, passed through Newcastle, on its way to the Stanhope and Tyne Railroad, being the second within these few weeks supplied from the Bedlington Iron Company. The last is a most powerful engine, having six wheels, all coupled, and calculated to draw a load of three hundred tons. The construction and execution of these engines reflect the greatest credit on the manufacturers, in compliment to whom the Railroad Company have named the most powerful "Michael Longridge," after one of the enterprising partners in the Bedlington Iron Company.—*Gateshead Observer.*

There are now at work on the Stanhope and Tyne Railway three handsome and powerful locomotive engines, one of them calculated to draw the enormous weight of 300 tons. This latter engine was manufactured at the Bedlington Iron Works.—*Sunderland Beacon.*

The Great North of England Railway.—This undertaking, we are glad to hear, is making considerable progress. The directors have decided in favour of the plan of Mr. John Green, architect, of this town, for the bridge across the river Ouse, near York. It is to be commenced almost immediately.

Proposed Railway from Gateshead to Green Court.—The extraordinary project of making a railway from Gateshead to Green Court, Newgate Street, in this town, is again revived. An application is to be made to Parliament during the present session for an act to empower the carrying of the work into execution. It is intended, it seems, to cross a public road called the Half Moon Lane, in Gateshead, on the level, but what other course it is to take we know not.

The Preston Railway.—We are informed that the Preston and Wyre Company mean to run steamers, drawing little water, from the Wyre to Rampside, and at the same time to make an economical railway from the latter place to Kirby Ireleth, to meet the coast railway, when made to that point—so that the great line may be used whilst the embanking of Lancaster sands, and the cutting through Furness, are going on.—*Whitehaven Herald.*

Aylesbury Railway.—A special general meeting of the shareholders was held at Aylesbury on the 20th Dec., for the purpose of considering an arrangement proposed with the London and Birmingham Company, as to the future occupation and loan of the Aylesbury Line of Railway. The secretary read a letter from the London and Birmingham Railway Company, offering to make an arrangement with the Aylesbury Company for a lease of their line of railway by the London and Birmingham Company, at a rental of 2,500*l.* a year for five years. The chairman having briefly stated the objects of the meeting, and several of the shareholders having expressed concurrence in the proposed arrangement, a resolution was unanimously carried, empowering and recommending the directors to accept the offer of the London and Birmingham Company.—*Aylesbury News.*

Branch Railway to Oldham.—An opinion appears to be gaining ground, that the directors or shareholders of the Manchester and Leeds Railway Company have an intention to construct a branch from their main line near Foxdenton, in Chaderton, to the westerly side of the town of Oldham. Surveys and levels have been recently taken of the country between Oldham and the main line.—*Liverpool Journal.*

Hayle.—The Hayle Railway is so far completed as to enable the company to send team waggons to the different wharfs for the conveyance of coal, &c., to the mines.—*Cornubian.*

Railway Collision.—On Friday se'nnight, a serious accident happened on the Grand Junction Railway, near Stafford. The Caliban, a spare engine, stationed at Stafford, in case of need, was passing to and fro, under the direction of the fireman only, the engineer not being with it. It was proceeding towards Penkridge, when the mixed train which leaves Birmingham at half past four was observed on the same line of rails. It appears that the steam of both engines was instantly turned off, the alarm whistle sounded by both, but they were too near each other for the collision to be avoided; and between 200 and 300 yards from the Stafford Station house they came into contact, with a tremendous crash. Providentially there was a luggage lorry and two empty horse boxes in the train between the engine and carriages for passengers, one of the horse-boxes was split in two, the lorry and the other horse-box was much injured, and the front of the first passenger carriage was completely stove in. By the violence of the concussion the Caliban became disentangled from its tender, which was thrown on the rails, and the fireman jerked from the engine into the tender, and the engine, left without a conductor, set off in the opposite direction, towards Liverpool, at a terrific speed!—This engine came to a stand still about ten miles off, the steam being exhausted; in its ungovernable course no accident occurred. The passengers in the train suffered no injury beyond a few slight contusions; but the guard, who was seated on the first carriage, sustained a compound fracture of the left leg and several bruises; and the engineman of the Caliban was also seriously hurt.—*Suffolk Advertiser.*

Manchester, Bolton, and Bury Canal and Railway. An engine and a carriage passed over about six miles of this railway, from Manchester towards Bolton, with a party of the directors, to try the engines and carriages over the rails, part of which are laid on timber (*Kyanized*), and part on stone. The result was satisfactory, as far as it went. A decided preference was manifested in favour of that part laid on timber, for softness of sound and smoothness of motion, over that laid on stone, where both sound and motion were, in some degree, more rigid, but not to the extent found on rails laid on stone-sleepers in the ordinary way. On this railway the rails are laid so as to maintain an uniform bearing, their whole length being on a continuous bed of stone or timber, to which they are, in both instances, firmly secured. The engines at present on the line were made by Mr. Edward Bury, of this town, and are fine specimens of workmanship. The carriages are somewhat similar to the first-class carriages on the Liverpool and Manchester Railway, as regards the body; but the under frame differs, being fitted with Bergin's patent spiral spring buffers at each corner, and have, in addition, a spiral spring at each end, for drawing so that when the carriages are put into motion and brought to rest, all unpleasant jerking and jolting are obviated.—*Liverpool Albion.*

Hull and Selby Railway.—The directors of this company contracted for the formation of two portions of the line, for which tenders were advertised; the Hessle contract, commencing on the l ts Mr. Atkinson's property, at Dairycoates, near this town, and terminating at Melt n, a distance of about seven miles; and the Howden contract, commencing at the western extremity of the embankment, near to the Market Weighton Canal, and terminating at the river Derwent, near Wressel Castle, a length of about nine miles. The contractors, in both cases, have engaged to commence the works without delay, and every exertion will be used to complete them at the earliest period possible. The foundations of the bridge over the Ouse, at Selby, are in progress, as are the castings for the iron-work of that bridge, and the iron bridge over the Market Weighton Canal: nearly 200 men are now employed at the embankment adjoining the latter, and the foundations of the bridge over it. The directors of the Manchester and Leeds, the York and North Midland, the North Midland and the Midland Counties Railways, are using every exertion to complete their respective undertakings; and as the Hull and Selby Railway will communicate with them, and through their medium with Liverpool, Manchester, Leeds, Birmingham, London, and almost every part of the kingdom where railways are formed or in progress, the advantages which the town of Hull, and the proprietors of the Hull and Selby Railway will derive from the early completion of the work, must be apparent; and we most sincerely congratulate our townsmen, and the parties more immediately interested on the prospect before them, as we anticipate a very favourable report being presented to them by the directors at the General Meeting, which is to be held in February.—*Hull Observer.*

Leeds and Selby Railway.—Within the last few weeks, a new engine, called the Hawke, has been put upon the line. It possesses great strength, and has the advantage of superior steadiness, by the addition of two small wheels to the other four It is a very fine, swift, and powerful engine, and was made by Messrs. Fenton Murray, and Co., of this town.—*Leeds Mercury.*

RAILWAYS IN SCOTLAND.—*The Dundee and Arbroath Railway.*—An act of Parliament was obtained in 1836 for the formation of this railway, which is considerably advanced, and will be completed in 1838. Its length will be nearly 16¾ miles, and the capital required 99,844*l.*—*The Glasgow, Paisley, and Greenock Railway,* for the formation of which an act was passed in 1837—commencing from the south end of Glasgow Bridge, it will proceed to Paisley, and running nearly parallel to the Clyde, with a branch to Port Glasgow, the line will terminate at Greenock, near the harbour. The estimated expense is 393,000*l.*—*The Glasgow, Paisley, Kilmarnock, and Ayr Railway.*—The line from Glasgow to Paisley is intended to be common to, and to be executed at, the joint expense of the Glasgow and Greenock, and Glasgow and Ayr Railway Companies. Near Daltry it will separate into two branches—one running direct to Kilmarnock, and the other passing by Kilwinning, where it joins the Ardrossan Railway—Irvine, where it communicates with the town and harbour—Troon, joining the Kilmarnock and Troon Railway, and terminating on the quay at Ayr. An act was obtained for this railway in 1837. The estimated expense is 659,000*l.*—*Oliver and Boyd's Edinburgh Almanac.*

Glasgow and Ayr Railway. A railway is about to be formed between Glasgow, Kilmarnock, and Ayr, which will materially increase the facilities of travelling between Glasgow and the north of Ireland. When this railway is opened from Glasgow to Ardrossan, or Troon, steamers will, very likely, be despatched from one of these harbours to Liverpool, Dublin, Belfast, and the north of Ireland, Campbelton, &c., as, by going in this way to these places, there will be about 60 miles of water travelling cut off from the present route, while there will be substituted 30 miles of railway, with such favourable levels, that the journey upon it will easily be performed in an hour.—*Northern Whig.*

Glasgow, Paisley, and Greenock Railway.—The directors have come to the resolution of commencing operations on portions of the road between Paisley and Port-Glasgow, and Port Glasgow and Greenock, and have given orders for the immediate preparation of the plans and specifications for the contracts.

GREAT WESTERN RAILWAY.

It is with the greatest satisfaction we are able to announce, that a full trial was made during the whole of Wednesday, in running the engines on two or three miles of this line near West Drayton, between London and Maidenhead. The object of the trial was to prove the rails, and *most satisfactory was the result*, both as to the increased width of gauge and the use of continuous bearers of Kyanized wood confined by piles, on which plan the line is constructed. An engine with eight feet drawing wheels, made by Messrs. Tayleur and Co., of Warrington, weight twenty-three tons, with the tender, water, coke, &c., and another engine made by Messrs. Mather and Dixon, of Liverpool, weight about nineteen tons, with the tender, &c., ran the whole day without producing the slightest vibration, either in the rails or the wood under them. The rails are in fact so beautifully firm, smooth, and true, that the engine glided over them more like a shuttle through a loom, or an arrow out of a bow, than like the effect on any previous railway, there is, literally, no noise—no apparent effort—nor can there ever be discovered any difference between the centre and the joint in the rails. A maximum speed was not attempted, as on so short a piece the momentum would be no sooner attained than it would require to be lowered in preparation for stopping the engine. A speed of forty-five to fifty miles per hour was attained, and when the engines are run, as they will be either next or the following week, on an eight or ten mile length, there is no doubt they will as easily run at a very much greater speed.—*Bristol Journal.*

FOREIGN RAILWAYS.

Milan, Dec. 19.—Three railways are about to be constructed in this city, viz., to Como, to Monza, and Venice. That to Como will be commenced immediately, the Austrian Government having already granted a patent for it to MM. Bruschetti and Volta, engineers of Milan. M. Bruschetti, well known in Italy as the author of two admirable works on the navigable canals and irrigation of Lombardy, the only books which contain a complete history of the progress of the arts of irrigation and internal navigation in that part of Europe, will shortly visit England for the purpose of examining the railways in that country, and of purchasing the rails and locomotive engines necessary for those proposed in the Austro Italic States.—*Morning Post.*

Railway to Versailles.—It is said that the project of a railway on the Rive Gauche to Versailles will be abandoned, and that the shareholders have come to an arrangement with those of the right bank. This is possible, but I do not believe it; for the parties have deposited with the Government one million and a half of francs, which they must forfeit if their railway be not complete within two years.—*Globe.*

French Railroads.—The Railroad Commission in Paris is making great progress in its labours. It has decided that the three lines to be first attended to, and to be executed by the Government, should be—1st, The line from Paris to Brussels; 2nd, From Paris to Orleans; and the 3rd, From Lyons to Marseilles. Besides these to be executed by the Government, it proposes that the road from Paris to Rouen, and the branch from Amiens to Calais and Boulogne, and from Basle to Strasbourg,

should be executed by railroad companies, either now existing, or which may be created. All branches and isolated lines it also thinks most desirable to reserve for the execution of companies.—*Atlas.*

Railway from Strasbourg to Basle.—A question has arisen to which country (France or Germany) the right belongs, to form the railroad between these two cities, or whether it shall be formed upon the right or left bank of the Rhine; the line as projected by MM. Kœchlin is 115 miles in length, and will connect six populous manufacturing towns, each of which contains upwards of 13,000 inhabitants, to whose manufacturing wants in the transport of merchandise and materials, the enterprise cannot fail to be extensively useful. The anxiety of the French party is at the present moment more excited from the circumstance of the Grand Duke having recommended the German Diet to take into its consideration on the 10th February, the propriety of forming the line on the German side, which, if resolved upon and commenced before the French project, will settle the question in favour of the German line.

Belgium and German Railway.—It is in contemplation to form a railway from Antwerp to Eberfeld, Venloo, and Dusseldorf; the line of country has been surveyed and found to be particularly favourable, and likely to be executed at a very cheap rate. A company is to be formed in Belgium for carrying the railway into effect from Antwerp to Venloo, and another company in Germany for the remainder from Venloo to Dusseldorf, or a united company of the two countries will be formed for carrying the whole into effect at once. It offers immense advantages to Antwerp, and will open a new port to the best part of Germany; it will also be driving the first portion of a line of railway into the very heart of Europe, which will some day be continued to Westphalia, Saxony, Brandenburgh, and Berlin; whilst the railway of Cologne will traverse the Upper Rhine, Franconia, and Bavaria, to the borders of the Austrian capital; the Belgic line will communicate by the Oder with the Baltic, and at the same time by the Danube with the Mediterranean.

AMERICAN RAILWAYS.

Cuba.—The first part of the railway from Havana was opened for passengers on the 10th of Nov. last. The length of the railway from Havana to the terminus at the town of Guines is forty six miles, of which sixteen miles and a half are now open. The road passes through the populous and most important part of the country for passengers, and the great traffic with Havana; the remainder of the line will soon be opened, a great part of the permanent rails being laid down. The population of Havana and neighbourhood exceeds 200,000, and of the several intermediate stations and Guines, 90,000. It is calculated that this road will form a most important source of income, and produce a very favourable change in the agriculture and industry of the island. The great facility of communication which the railroad will afford to passengers, and the saving of time and expense for the conveyance of merchandise, is immense, and can only be fully understood and appreciated by those well acquainted with the country, where there exists no internal navigation, or roads and means of conveyance calculated for these objects, as in Europe.

Auburn and Rochester Railroad. Robert Hingham, Esq., engineer of the Company, has made a Report to the directors, from which we glean the following items. The route estimated upon, commences at the termination of the Auburn and Syracuse Railroad, and passes through Seneca Falls, Waterloo, Geneva, Vienna, Canandiagua, and Victor, extending to a point on the west side of the Genessee River, in the central part of the village of Rochester, where the Tonawanda Railroad can be connected with it. The distance from the village o Auburn to the city of Rochester, by this route, will be 78½ miles; and the road can be constructed without having any grade to exceed 28 feet, ascent or descent, per mile, and that without any very deep cuttings on the summits, or high embankments in the valleys. The estimated cost of the road, graded for a double track, and a single track laid, is 1,091,376.72 dollars, or 14,030.27 dollars per mile For a double track complete, 1,441,398.17 dollars, or 18,390.97 dollars per mile. The revenue likely to accrue from the road is estimated at 361,517.50 dollars per annum; of which 268,368.50 dollars is for the transportation of passengers, and the remainder for that of freight. As the road is of about the same extent as that of the Utica and Schenectady Railroad, the engineer estimates the yearly expenditures at about the same sum, which he puts down at 90,000 dollars; which, being deducted from the estimated revenue, leaves a net profit of 271,517.50 dollars, or nearly 19 per cent per annum on the estimated cost of the road for a double track completed.—*New York Advertiser.*

ENGINEERING WORKS.

Ulster Canal.—This vast work, which ultimately will connect the two great inland waters of the Lough Neagh and Lough Earne, has been completed from the town of Charlemont to the town of Monaghan, a distance of twenty-six miles; and is opened for the purpose of trade. Two of the canal boats, laden with coal, were on the day of opening taken into the lock at Charlemont from the river Blackwater, and from thence despatched, the one to sell her cargo at Caledon, and the other at Monaghan; at each of which towns they respectively arrived without meeting any obstruction or hindrance in the navigation.—*Dublin paper.*

Caledonian Canal.—Part of the side wall of the lower lock at Fort Augustus, below the surface of the water, has unfortunately fallen in. This will occasion a temporary interruption of the navigation for vessels of burden. The Staffa steamer got through the last trip with some little difficulty, but we should fear the larger Glasgow steamers can hardly pass. Several large vessels happened inopportunely to have reached Fort Augustus about the time of the accident, by which they are stopped in their progress. It is the intention, we believe, to fill up the breach in the mean time with bags of sand and earth, till the season admits of a thorough repair.—*Inverness Herald.*

The Dudley Canal Company are constructing a large reservoir at Netherton, near Dudley, which will cover an area of 11 acres clear of the embankments, having a regular depth of 55 feet excepting the slopes, and is calculated to hold 6000 locks of water. The works are contracted for by Mr. Oakes, of Derby, according to the plans and under the superintendence of W. Richardson, Esq., engineer, of Dudley, and are engaged to be completed by the close of the present year.

There are building at Cumberland and on the Weir no fewer than ninety-six ships, some of them of a very large tonnage; and eight have been launched within these few days.—*Cumberland Pacquet.*

NEW CHURCHES.

Glamorganshire.—A new Church is in the course of erection at Newbridge, in this county, where, within the last four or five years, several iron and tin works of the largest size have been established, and from which cause the population has increased four or five fold. It is calculated to hold 850 persons, of which four-fifths are in free seats. It is in the Norman style, with a square tower situated at the angle of the building 80 feet high; its length is 80 feet, its width 40 feet, and is built of a stone raised in a field immediately adjoining, of a grey colour; its texture is exceedingly firm, and its colour forms a very pleasing contrast to the Bath stone, of which the door and window jambs, cornice, clock faces, &c., are constructed. The contract is under £2000. The architect is J. H. Wyatt, Esq.

Brecon. It is in contemplation to rebuild the body of St. Mary's Church, in the town of Brecon, the tower of which is a fine specimen of late Gothic architecture. The design, which is calculated to hold 1,400 persons, has been prepared by J. H. Wyatt, Esq., and is estimated at £4,500, including the necessary reparation of the tower.

Shrewsbury.—The Rev. Richard Scott, who enlarged five of the churches at Shrewsbury, has fitted up, at his own expense, the altarpieces of St. Giles and St. George, and presented to the parishes of St. Chad and the Holy Trinity magnificent silver communion services.

Glasgow.—We feel sincere pleasure in being able to announce, that the new Church at Camlachie is in such a forward state of progress, that, weather permitting, the neat spire with which it is surmounted will be finished in a few days; that Chalmers' Church, which is proceeding with unusual expedition, is ready to receive the roof; that Brownfield Church, Anderston, is already roofed; that the foundation of Wellpark Church, foot of Drygate, has been commenced; that Hutchesontown Church has been contracted for, and will be begun immediately; and that arrangements are in progress for the erection of Martyrs' Church, near the martyrs' stone, at St. Rollox, which will be proceeded with early in the ensuing year. These are pleasing facts, which we hope will encourage the friends of the Church in Glasgow and throughout the country to redoubled exertions. If the Christian public are equally liberal in their contributions next year, and we are persuaded nobody is the poorer for the money contributed to these erections, we hope to be able to present our readers with as gratifying a catalogue of new churches this time twelvemonth. If permanent good is to be accomplished, it must be sustained by persevering efforts. To supply the wants of an increasing population, we require five or six churches a year, independently of the best exertions of the Dissenters. There is room enough for both Churchmen and Dissenters to do their utmost, with the moral certainty, that without assistance from Government, the great object in view will never be fully attained.—*Guardian.*

Yorkshire.—Earl Fitzwilliam, says the *Sheffield Independent*, is at the present moment most liberally assisting in the building and enlarging no less than six churches in this neighbourhood, viz., a subscription of £500 towards the erection of a church at Thorpe; a liberal sum for a new church at Kimberworth; £500 in aid of the rebuilding of Rawmarsh church; and the entire cost of enlarging the churches of Tinsley, Wentworth, and Tankersley, for the accommodation of the poor in their respective parishes. In addition to this munificence towards the church, we may add, that within the last few years his lordship and his revered and venerable father have expended many thousands of pounds in the erection of the churches of Swinton, Hoyland, and Greasbrough.

Wiltshire. A Chapel has just been built at Whitley, in the parish of Melksham, under the superintendence of J. H. Wyatt, Esq.; it is of the pointed or early English character, capable of accommodating 550 persons, and the cost will not exceed £1,600 in its erection.

Middlesex.—The Metropolitan Church Building Committee have decided on building a new church in the Tenter Ground, Goodman's Fields, the working drawings for which are being prepared by J. H. Wyatt, Esq., who has been appointed the architect. It will accommodate about 1,200 persons, according to the sizes of seats adopted by the Church Building Commissioners; but not more than 1,080, according to the increased size of pews and free-seats decided upon by the Committee. It comprises a tower and spire, 100 feet high, and is estimated at 3,800*l.*

Warwickshire. Competition drawings were sent on the 15th ultimo for a church to be built at Oldbury, near Birmingham. The church is to accommodate 1,500 persons, and to have a tower; the amount limited to 4,000*l.*!! to include the architect's commission and clerk of the works' salary. The instructions are, that the church is to be of a plain character; and if the estimate should not come to that amount, the church is to be enlarged.

Shoreditch.—A new Church is to be built in this parish, under the direction of Mr. Vulliamy.

PUBLIC IMPROVEMENTS AND BUILDINGS.

Glamorganshire.—A Public Market House has just been erected at Merthyr Tydvil, in this county, by J. H. Wyatt, Esq., Architect, which occupies a site of 250 feet by 200 feet, and comprises within its walls, 112 butchers' and fishmongers' shops; 87 standings for poultry, eggs, &c; 200 stalls for fruit and vegetables; and 76 stalls for hawkers. There is a fountain and reservoir for water in the centre; and two cart gangways running through the Market, which gives an easy access for heavy goods to all parts. There is an office for the clerk of the market, and a weighing-room, with other conveniences. It is surrounded by four streets, and is approached by twenty archways. The character of the architecture is Italian, having an ornamental clock-tower. It is built of a hard grey stone; the door jambs, archivolts, cornices, and other external moulded work, are of Bath stone. The cost does not exceed £7,000. Slaughter-houses, in connexion with this Market, are being built, at a further expense of £1,000.

Breconshire.—A new Market Place and Slaughter houses are about being erected at Brecon, by the corporation of that town, from the design of J. H. Wyatt, Esq., the estimate for which is £3,000. The corporation have purchased more than sufficient ground for their market with a view to widen Castle Street, the remainder of which will be let on building leases.

Montrose.—*New Infirmary.*—The managers of this institution have now made choice of an elegant design for the building which they are to erect on the Castle Hill. The design is by Mr. James Collie, architect, Glasgow, to whom the premium of twenty guineas has been awarded. We understand it is the intention of the managers to proceed, with all despatch, in the erection of the structure.

Five Monuments to the memory of the late much-regretted general, the Duke of Gordon, are erecting in the counties of Aberdeen and Banffshire.

Monmouthshire.—The Guardians of the "Newport" Union are building a workhouse on Stow Hill, to contain 800 paupers. It is built of stone, raised on the site. The estimate is 3,900*l.*

Hull.—A club house is about to be established in Hull, under the title of the "Union Club," similar to the London club houses. It is to be formed of gentlemen of all parties, and politics are to be excluded.

Westminster Cemetery.—The ground (about 40 acres) intended for the Cemetery is situated on the east side of Kensington canal, between the Fulham and Brompton roads, which will, early in the ensuing spring, be laid out as an extensive ornamental parterre, surrounded with catacombs and a terrace. A church, in the early English style, is to be erected at the north end. Stephen Geary, Esq., is the architect.

Botanical and Zoological Gardens are about to be formed at Leeds and Newcastle.

Subscriptions are on foot for erecting a Public Monument to the memory of the Protestant Martyrs of England, in the London Cemetery, at Highgate. A more suitable spot could not have been chosen: it is the most elevated round the metropolis, and remarkable in history, being the very place where the conspiracy was concocted, on the 5th of November, 1605, for the destruction of both Houses of Parliament: the spot to this day is known by the name of Traitors' Hill. We trust that the design will be similar to some of the crosses in the pointed English style of the fourteenth century.

FOREIGN INTELLIGENCE.

Havre, Jan. 2.—Mr Bellouin, one of the proprietors of the grant for using the American Patent Hydraulic Dry Dock, has been at Havre, to consider of the best means to be employed for establishing the Patent Dry Dock in this port. M. Legrand, general director of bridges and roads, and M. Frissard, chief engineer of the ports, have taken considerable interest to demonstrate the advantages of this ingenious machinery to the port of Havre, which will be improved by means at once so simple and so powerful as to lay up dry, ships of the greatest tonnage. M Bellouin is now adopting proceedings for the purpose of obtaining from Government its consent for forming a Company, to establish, at their own expense, and at a convenient spot, the dry dock, which will supersede the dry creeks that were proposed.

New York Water Works.—There are more than twenty miles of this work under contract and in progress. About twelve hundred men are employed on the various parts of the line, and the expenditure for the month of November alone amounted to nearly 45,000 dollars. Of the aqueduct, about 2,500 feet are completed. About three thousand labourers will be employed on the work in the spring.—*Charleston Mercury.*

Croton Water Works.—On Friday last we made a visit to the Croton Water Works, and passed along the line, north of this place, to its junction with the Croton. The contract for building the dam has just been taken; much of the foundation wall will be built this fall, and the materials collected during the winter for its completion the next season. Several sections that we visited are already far advanced, and parts of some entirely completed, with the exception of the outside embankment.

Several extensive tunnels are now under way, in some of which the blasters are already nearly 200 feet beyond daylight.

It is surprising to observe how beauty and solidity are blended in the construction of this stupendous work. Having had much acquaintance with the business of brick and stone masonry, we can say that better or finer cannot be found in the United States than that now being done on the Croton works.

Few, very few, have an adequate idea of the magnitude of this undertaking. A slight one may be formed by a part of a single section which we examined. At this point it passes a deep ravine; here a wall some fifteen feet thick is carried to nearly thirty feet in height, composed first of layers of large flat stone compactly laid, and then a course of stone pounded to the size of pebbles, so that every crack and crevice are filled up; and upon this a thick laying of stone and water cement, that the whole may become as one solid rock.

It will remain an enduring monument to the enterprise and perseverance of the city of New York, and will rank among the most important works the hand of man has ever accomplished.—*Hudson River Chronicle.*

St. Isaac's Church, at St. Petersburgh, is probably the largest building which modern Europe has seen arise, and will long continue an object of wonder to strangers. It is a mass of architecture 340 English feet in height, entirely of marble and metal, decorated outside with 112 columns of red granite, each consisting only of one piece. The marble dome, surrounded by a colonnade, is 109 feet in diameter, and around it rise four steeples intended for the reception of bells. The whole forms a monument to be compared only with the colossal works of India and Egypt. The church is to be finished in 1841. The twenty-four columns which support the dome are each forty-two feet high, of a single piece, and from the same quarries in Finland which furnished the Alexander column; each weighs 200,000 lbs. The machinery by which they were raised to a height of 200 feet and fixed in their respective places, is in itself deserving of wonder and admiration.

Burning of a Church at Ghent.—A letter from a gentleman residing at Ghent contains the following intelligence:—

"Saturday, January 20, two o'clock in the afternoon.

"A frightful fire has just reduced to ashes the enclosure of the church of the Augustines, and the church itself. It broke out at about three o'clock in the morning in a manufactory that formed one wing of the building, which is still burning. Thence the flames extended to the church, an edifice of considerable beauty, which is completely destroyed. It contained some valuable pictures by De Croyer and De Reyschoet, which are lost, as well as the very remarkable object known by the name of 'The Pulpit of Truth.' The tower of the church fell this morning about seven o'clock. Nothing remains but the walls. That part of the building which was occupied by the monks has been wholly burned, with the library, of which I saw some of the books thrown up into the air. The library of M. Lammens must have suffered much. At this moment attempts are making to save part of the property, by conveying it to the neighbouring houses. The crowd has been so great that I have not been able to get near enough to ascertain how much has been rescued from the flames. Happily the building was vaulted. The whole, however, is at present in a blaze, and I do not know if there will be time to secure all the books."

Singapore New Church.—The style of the building is Roman. The sea-front consists of a pediment, carried out on six Doric columns, the enclosed space being partly occupied by the chancel, which stands out in a semicircular form at this extremity; a cross standing in strong relief against the tympanum of the pediment. The land-front is the same; and includes a portico in which two carriages can pass each other. The sides of the building are adorned with pilasters, surmounted by a ballustrade; a spacious verandah, of the same dimensions as the portico of the land-front, occupies both sides; so that every side of the building can be entered under a complete and agreeable shelter. The interior form of the church composes three parts of a circle, which is cut off at the end nearest the chancel. The pulpit stands under a lofty arch, which stretches the whole width of the chancel; and the walls at either side are ornamented with Ionic pilasters, with intervening spaces adapted for mural monuments. The roof is supported by Ionic columns, which rest on pedestals, rising from the floor of the building to the level of the galleries: the latter are built over the space which encloses the verandah and portico below, and are twenty-two feet in width. The interior is graceful and pleasing; it is effectually shaded, and well ventilated, and the accents from the pulpit are heard with ease and distinctness throughout the building. The exterior is not very imposing; the lowness of the building gives it a less striking character than it would possess if raised on a more elevated basement; but the funds, at the command of the architect, it is understood, were insufficient.—*Singapore Free Press.*

LOUVRE.

The re-opening of the Galleries of the Louvre, together with the Naval Museum, hitherto accessible only to the privileged, the Spanish Museum, the Hall of the Council of State, and the Galleries of Casts from the Antique, thus throwing open to the public the entire building, has created considerable interest in Paris. The Gallery of Spanish Paintings and the Naval Museum attracted the largest share of public attention. Besides the copies of Raphael, placed in the Hall des Sept Cheminées, are rooms, each particularly devoted to the works of some distinguished painter; among which are exhibited the admirable Cartoon of Le Guido, the Chartreux of Vernet, the Atala and Endymion of Girodet, the Education of Achilles of Renaud, and the Marcus Sextus of Guerin. In the Egyptian Gallery no new arrangement has been made. The three new halls opened to the public are the saloon of Henry II., the bedroom of Henry IX., and the cabinet of Anne of Austria. In the Hall of Sculpture (la Renaissance) is exhibited the tomb of Isabella the Catholic, and of Ferdinand, and other valuable works of art hitherto unknown in France. In the new galleries, under the colonnade, is collected a most complete series of casts from the antique, consisting of the bas reliefs in the British Museum, from the Parthenon, the Horses of Venice, the Laocoon, &c.

MISCELLANEA.

BURNING OF THE ROYAL EXCHANGE, LONDON.

The destruction of this extensive edifice, scarcely paralleled in the commercial buildings of Europe, is an event of too much importance to the arts of this country not to be noticed in our pages. In the present Number we shall confine ourselves to an account of the fire, and in our next we will give a general description of the building, if possible accompanied by a plan, showing the site and dimensions.

Soon after 10 o'clock on the night of Wednesday, the 10th instant, the fire broke out in Lloyd's coffee-room, at the north-east corner of the edifice, opposite the Bank. It was first discovered by one of the Bank of England watchmen, who gave the alarm at the gates, and the Bank engines were immediately brought. A strong party of the City police and night watchmen, and the soldiers on duty in the Bank, repaired to the spot, and expresses were sent to the fire engine stations, at which period no signs of the fire could be seen from the street. Considerable difficulty was experienced in obtaining entrance to the building, but when this was accomplished, the flames burst through the windows with great fury, and drove the people back. An extraordinary scene ensued: the whole neighbourhood was alarmed, and the tradesmen who held the small shops around the exterior of the building instantly commenced the removal of their goods. It was at once predicted that the whole building would be destroyed, and this foreboding was realized too correctly. The several engines, with 63 of the fire brigade men, reached the spot within an hour after the fire broke out. Before any water could be thrown on the building, it was necessary to thaw the hose and works of the engines, by pouring hot water upon them, and this caused some delay. For some time afterwards, owing to the intense frost, there was great difficulty in working the engines; while the fire continued extending in a south west direction, consuming the whole of the long range of offices belonging to the Royal Exchange Assurance Company.

At 12 o'clock, these, and Lloyd's establishment, the coffee room, the captains'-room, and the offices of the underwriters, presented one body of flame, which shot up to a great height, illuminating the Bank, St. Bartholomew's, St. Michael's, and St. Mary's churches. Every object was as visible as at noon day.

At one o'clock, the north and west sides of the Exchange were consumed, and the fire was rapidly approaching the new clock tower. The efforts of the firemen appeared not to have had the least effect; the flames extended rapidly over the building, proceeding from floor to floor, and running along the corridors with the greatest rapidity. At two o'clock the flames reached the tower, and the excitement of the assembled multitudes in Cornhill, Mansion house street, and the Poultry, became extreme. A thousand voices murmured, "It has reached the tower, it's all over." The appearance of the vast conflagration at this period was awful; the whole of the Exchange was completely enveloped in flames, and the heat was so great that the firemen and auxiliaries could scarcely pursue their labours near the burning mass. The interior wood work of the tower was speedily reduced to ashes; the musical peal of eight bells, with a tenor of about eighteen cwt., fell one after the other, carrying away every thing in their progress towards the pavement, including the roof and stonework, and the arch over the centre entrance. The clock had a very singular effect while the tower was burning. The plates of the dials became red-hot, and the hands pointed to the hour, twenty five minutes past one, when the wood work took fire, melting the chime barrels and the machinery in a few minutes. It is utterly impossible to describe the scene which presented itself to the eyes of the spectators; although the sky was unclouded, and the moon shone, yet its brightness was totally obscured by the dense volumes of smoke and flames which issued from the ruins; whilst a shower of fire was seen hovering over the houses to the south of the Exchange. At half-past two o'clock, a general opinion seemed to prevail that the offices of the Royal Naval Hospital, at the side of the Ex-

change, would not be reached, and several engines were ordered to be drawn up opposite Sweeting's Alley. On this being done, the hose were conveyed to the tops of the houses on the east side of the alley, which is a very narrow one, by which means the firemen had a perfect command over that portion of the Exchange, and torrents of water were discharged into the interior of the building; but notwithstanding all their efforts, the flames rapidly extended, and the firemen were obliged to retreat, in consequence of the great heat.

At half-past three o'clock the north-west and south sides of the immense building were burnt down; and the flames had reached the east, threatening the entire destruction of the range of shops and dwelling-houses connected with the Exchange, and forming the west side of Sweeting's Alley. At four o'clock, the fire was still raging with unabated fury. The wind, which was blowing fresh all the night, had increased almost to a tempest, and the immense area was one body of flame. The remaining wing, the east, shared the fate of the others, and with it the houses and shops in Sweeting's Alley, forming part of the main building. The firemen again got on to the roofs of the houses on the opposite side of Sweeting's Alley with their hose and branch-pipes, connected with eight powerful engines, and directed a plentiful supply of water over the shops and houses below them, by which they were kept cool and prevented from igniting. The eastern wing of the Exchange, like the others, was soon reduced to a heap of ruins by the flames spreading from office to office. The roar of the winds, and the rush and crackling of the flames, the falling of huge timbers, and the noise of the engines, occasionally intermingled with the shouts of the firemen, were deafening.

The walls in the interior of the Exchange next fell with a tremendous crash carrying with them the numerous statues of the Kings and Queens who have reigned in England from the time of William the Conqueror. At five o'clock, the fire was still raging; but all apprehension of danger to the surrounding buildings was at an end.

The origin of the fire has not been satisfactorily explained. It is stated to have arisen in the stoppage of one of the flues connected with the kitchen of Lloyd's Coffee-house. This department was separated from the rest of the building by a thick but old boarding, which, indeed, formed the only partition between the several offices on the first floor. To this want of a party wall may be traced the speedy ignition of the premises on all sides, a circumstance which, with a north east wind, would have been impossible, had such a partition existed.

The Railway Steamer.—Were any of the ancients to rise from their tombs, and to behold a steam-ship full of passengers darting up the Thames, or a train of carriages with 1,000 people flying along a railroad at the rate of 30 miles an hour, they would be surprised at the fact of their revisit to the same planet they had left, since 1000 years in the grave may probably seem no longer than a short siesta after dinner. Without rudder or rein—without tug or tow-rope—without chart or compass—without impulse from man, or traction from beast—this maximum of power in the minimum of space—this magic automaton, the Railway Steamer, darts forward on iron pinions, like an arrow from a bow, along its destined course. Devised by science, but devoted to industry—harmless as the dove, if unopposed, but fatal as the thunderbolt, if obstructed in its career, this astonishing offspring of human invention, this giant in strength, though a dwarf in stature, drags along, and apparently without effort, whole cargoes of commerce, merchants and their merchandise, artisans and their arts, travellers and their traffic, tourists and their tours, in short, every thing that can be chained to the tail of this herculean velocipede. It nearly annihilates distance between the inhabitants of a state, and thereby converts, as it were, a whole country into a city—securing all the good effects of combination and concentration, without the bad consequences of a crowded population. By the railroad, Liverpool and Manchester, Birmingham and the metropolis, are made contiguous cities, while wide and fertile tracts of country intervene.—*Dr. J. Johnson.*

Extracts from Captain J. T. Smith's Notes to his excellent Translation of a Treatise on Mortars and Cements, by L. J. VICAT.

"LIMESTONE.—An abundant supply of hydraulic limestone is distributed through England by the lias beds, which the geological maps represent traversing the island from north to south, commencing at Whitby, on the Yorkshire coast, passing through that county, and the west of Lincolnshire, bordering Nottinghamshire, thence following for some distance the east bank of the Trent, afterwards crossing Warwickshire and Gloucestershire, and making its appearance in various parts of Somersetshire, finally terminating near the junction of the counties of Devon and Dorset, in the neighbourhood of Lyme. 'This formation consists of thick argillaceous deposits, constituting the base on which the whole oolitic series reposes. The upper portion of these deposits, including about two thirds of their total depth, consists of beds of a deep blue marl, containing only a few irregular and rubbly limestone beds. In the lower portion, the limestone beds increase in frequency, and assume the peculiar aspect which characterizes the lias, presenting a series of thin stony beds separated by narrow argillaceous partings; so that quarries of this rock at a distance assume a striped and riband-like appearance; in the lower beds of this limestone, the argillaceous partings often become very slight and almost disappear, as may be seen in the lias tract of South Wales: beds of blue marl with irregular calcareous masses, generally separate these strata from the red marl belonging to the subjacent new red sand-stone formation. The limestone beds, towards their centre, where most from external mixture, contain more than 90 per cent. of carbonate of lime; the residuum has never been distinctly analyzed, but appears to consist of alumine and [illegible] iron, and in some varieties traces of silex have been found: towards the edges of the beds, however, where they come in contact with the alternating strata of clay, the proportion of alumine is, as might be expected, more considerable. This limestone is particularly characterised by its dull earthy aspect, and large conchoidal fracture; in colour it varies in different beds from light ash blue, or smoke-grey, to white; the former varieties usually constituting the upper; the latter, the lower portions of the formation. The blue lias, which contains much iron, affords a strong lime, distinguished by its property of setting under water.'—'The irregular beds consist of fibrous limestone and cement stones (septaria) so called, because used in making Parker's cement.'—*Conybeare and Phillips's Geology of England and Wales.*

"Towards the southern extremity of the line formation above referred to, the bed widens in extent, so as to include a small part of Glamorganshire, whence the celebrated Aberthaw limestone is procured. But of late years the valuable properties of this lime have acquired it a reputation at other points of the line above traced, as for instance, at Barrow-on-Soar, in Leicestershire, and Watchet, in Somersetshire, both of which will be observed to be within the limit of the same formation. It appears, however, that the quality of the lime is not uniform throughout the whole extent of its range, being in some places slightly less energetic than others, a circumstance no doubt to be attributed to variations in the quality, or proportion, of the alloy contained by it.

"DECAY OF STUCCOES.—During my superintendence of public buildings in the northern division of the Madras presidency, I made many endeavours to investigate the cause of the very speedy decay, in certain situations, of stuccoes, which in others, apparently similarly exposed, possessed the greatest durability; and I was soon led to observe the very injurious effects of alternations of moisture and dryness upon mortars composed of rich lime and sand, by noticing the almost constant failure of those mortars which exhibited a *mottled* appearance on first drying. This phenomenon, which is interesting when viewed in connexion with the future durability of a cement, consists in a distinct exhibition of the courses of the masonry through the plaster, the joints being clearly defined, sometimes on a darker, and at others on a lighter ground, and indicating at one time an excess of humidity in the spaces opposite the bricks, and at others opposite the joints. These appearances were generally confined to within a few feet of the lower portion of the walls, which parts alone were subject to the early decay I allude to; and as they take place in a climate not subject to frost, and denote a cause of the degradation of mortars hitherto unexamined, it may be useful to notice briefly the leading facts which were observed.

"Common stucco, when plastered on a wall of brick and mortar, generally presented the appearance, on first drying, of damp joints and dry spaces (opposite the bricks); and this seemed to be owing to the spongy nature of the bricks, which, unless fully saturated with water in using them, caused the stucco to part more speedily with its moisture in those parts over them than elsewhere. After the same stucco has once thoroughly dried, if the situation be damp, these appearances may be reversed, more especially if the bricks be of an absorbent kind, or ill burnt. In this case it appears that being kept constantly damp by sucking up moisture from the earth, they become more charged with it than the stucco itself, which is of a less permeable nature; and exhaling it during hot weather, render the *spaces* damp in comparison with the joint, which have remained dry. And it is remarkable also, that, in such a case, the phenomena may be again reversed by soaking the whole surface with water; for if the stucco be not a very compact one, so as completely to exclude imbibition, the subsequent desiccation will proceed so much more rapidly opposite the bricks, which will then be comparatively *dry*, that the joints will continue long damp after the spaces have ceased to be so. Stucco, covering walls built of brick and *clay*, I have always seen exhibiting dry spaces and damp joints.

"Roman cement, Mr. Loriot's composition stucco, and such as *set* on first applying them, I have generally observed to present an opposite appearance to common mortars in which the lime has been well tempered. The best mortars, when exposed in situations which occasioned the above phenomena, were liable to early ruin, sometimes within a week of their completion, the decay being invariably confined to the region in which they were manifested, such as were beyond the reach of the moisture remaining perfectly sound for years. The failure was accompanied by the separation of large flakes, which were detached from the body of the cement, leaving the mass in a crumbling and disaggregated state behind it. These flakes varied in thickness with the age of the mortar, a fact which led me to the supposition, that they might consist of the superficial crust of the regenerated mortar, separated from the part behind it by some internal changes, occasioned by the alternations of moisture and dryness; but I found it impossible to prove this point directly, from the difficulty of detecting the separation of a patch of the falling plaster, in time to find the parts in contact with it still in a caustic state."

NOTICES TO CORRESPONDENTS.

We have received the plans and elevation of a Roman Catholic Church, now being built at Rosemont, in the county of Westmeath, Ireland, by D. J. Henry, Esq., Architect, and we have also received some other designs of churches, all of which we are obliged to postpone for some time; if it should meet with the approval of the profession, we will publish a distinct work on churches, for which purpose we shall be happy to receive communications, elevations, sections, plans, and specifications of churches erected, or in progress.

If Mr. Prosser will refer to the plans and sections accompanying the new standing orders of the House of Commons for last session, or to the plans accompanying Mr Simms' work on "Sectio-Planography," he will find that Mr. Macneill's method of laying down the section on the plans is very different from either the mode recommended by Mr. Tredgold or by Mr. Churchill; consequently, we have not published the communications and accompanying drawings which he has done us the favour to forward.

It is our intention to give some particulars of the principal Exchanges in Europe and America, for which purpose we shall be thankful for any communications or information on the subject. It would be very desirable to have accurate dimensions of the plans, and also drawings, if any of our Subscribers could favour us with them.

We have received a valuable communication from Mr. [illegible], of [illegible], which came too late for insertion in this Number, upon experiments and calculations made by him, during the late severe weather, upon [illegible] [illegible] and [illegible], by means of his newly invented egg-shaped [illegible], with [illegible] [illegible].

Books for Review should be sent early in the Month.—Communications, on or before the 20th—and Advertisements on or before the 25th instant.

MR. BRUNEL'S EXPERIMENTAL BRICK AND CEMENT ARCH,

ERECTED IN THE YARD AT THE THAMES TUNNEL, ROTHERHITHE.

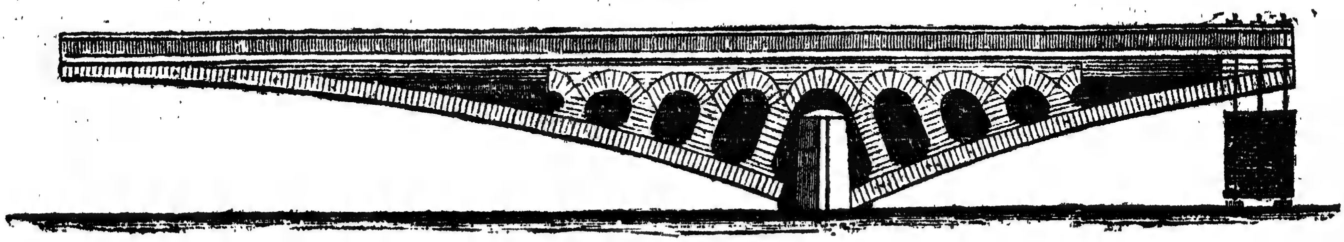


FIG. 1. ELEVATION.

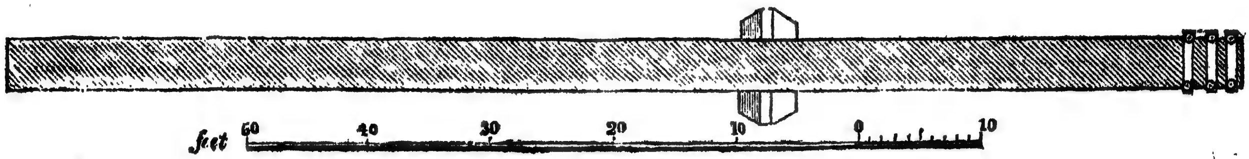


FIG. 2. PLAN.

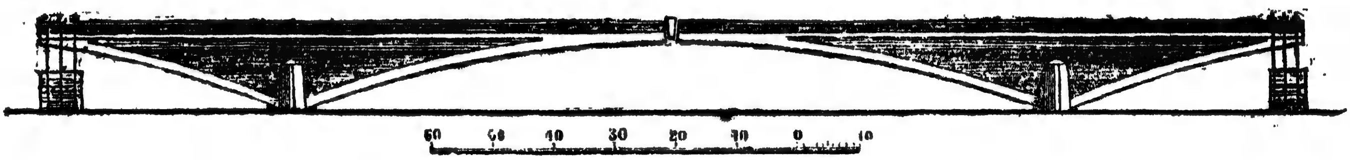


FIG. 3. ELEVATION OF A BRIDGE, CONSTRUCTED ON THE PRINCIPLES OF THE EXPERIMENTAL ARCH.

FIG. 5.

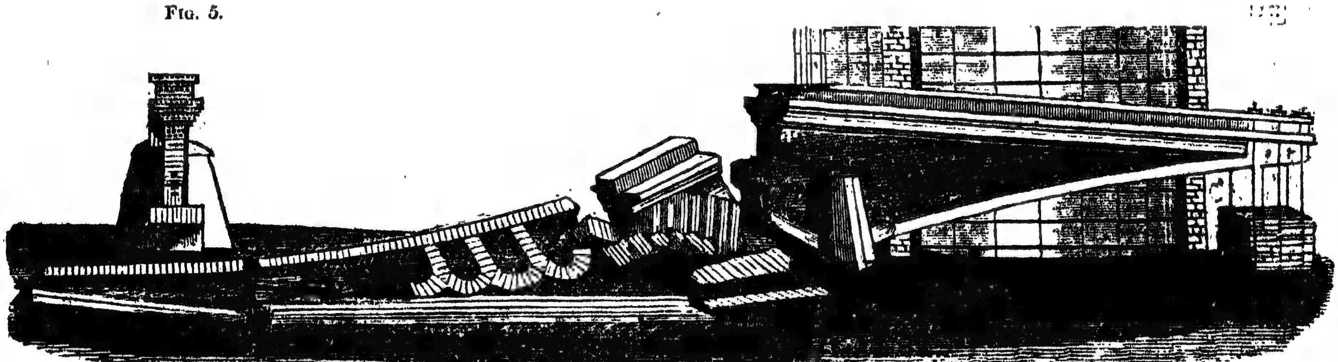


FIG. 4. THE ARCH AS IT APPEARED AFTER IT HAD FALLEN DOWN, ON THE 31ST OF JANUARY, 1838.

EXPLANATION OF DRAWINGS.

Fig. 1. Elevation of the experimental arch, as constructed by Mr. Brunel.

Fig. 2. Plan of same.

Fig. 3. Elevation of a bridge constructed on the principle of the experimental arch.

Fig. 4. Sketch of the experimental arch, as it appeared after it had fallen down on the 31st January last.

Fig. 5 is a section of the pier, showing the number of iron hoops, which are marked by dark lines or dots, and are laid in each course thus—in the upper course six pieces, the course under four pieces, the third, fourth, fifth, sixth, and seventh courses six pieces, eighth course five pieces, ninth course four pieces, tenth course three pieces, eleventh course two pieces; thence downwards are laid three pantile laths in the centre of every other course, lapped at meetings, in all ten layers or tiers; the lower tier is four feet six inches from the ground.

MR. BRUNEL'S EXPERIMENTAL BRICK AND CEMENT ARCH.

When we behold the stupendous works of man, we are often bewildered to account for the method of their construction, and this apparent difficulty is only to be removed by witnessing in any of these undertakings their slow and sure progress by the aid of machinery and art. There is, perhaps, no instance in which the force of this remark is more striking than in the art of bridge-building, of which this country possesses the finest specimens in the world, both for architectural beauty, magnitude, and solidity; the centerings upon which they were erected merit no small share of this remark. The above engraving (fig. 1) represents the *experimental brick arch*, invented by Mr. Brunel, Engineer-in-Chief of the Thames Tunnel, which at once introduces to the engineering world an entirely new feature, offering the united advantages of economy and utility. The superiority of this design is very evident; in the first place, centering is wholly dispensed with, and the curvature of the arch is obtained by means of a face-mould or sweep, of such convenient length as to be readily handled by the artificer. The principle upon which this bridge is chiefly founded, is (as may be seen by the drawing) by observing a strict equilibrium in the erection as it advances from each side of the piers; the ribs on both sides are executed for a distance of fifteen feet, without any other tension than the adhesive qualities of the cement and brick-work, of which this experiment is chiefly constructed. Above the height of five feet from the ground line, and to the extent of twenty feet either way, three fir pantile laths are inserted in the centre of every other course to the height of nine feet, and above that height hoop-iron, one inch wide, and one-sixteenth of an inch thick, are laid horizontally in each course of brickwork; the ribs of the two arches were gradually advanced by adding half a brick in thickness on to the projecting end, set in cement, which was done by the bricklayers standing on a scaffolding suspended from the top of the ribs, and advanced as the work proceeded; the two arches were then carried forward to the distance of twenty-five and thirty feet, the original extent which Mr. Brunel intended to confine his experiment: having so far succeeded, he was induced to extend his experiment still farther, and as there was a building immediately adjacent to the end of one of the ribs, he was obliged to confine his experiment to one of the ribs, which he was enabled to do by suspending a platform to the end of the shorter one, and as the longer rib advanced, placing weights on the platform to counterpoise the additional leverage of the longer rib; by these means he was enabled to extend the arch to the distance of forty-five feet. Mr. Brunel, finding that his experiment was crowned with complete success, was induced to carry it on still farther, which he ultimately did, by extending the arch to the surprising distance of sixty feet from the pier without any centering, support, or scaffolding on the ground; so particular was Mr. Brunel with the men, that he gave directions that if any of the bricklayers were found constructing any part of the arch from the ground, they were to be immediately discharged.

It will be perceived by the drawings (figs. 1 and 3) that the experiments of building one-half of an arch extending to sixty feet from the pier, was equal to a complete arch of 120 feet span, the rise or sine of the arch is ten feet six inches, and the radius of curvature is 175 feet, being the same as the centre portion of the ellipse of the large arch of London Bridge, and also the great arch of Chester Bridge; the weight suspended to the shorter rib to counterbalance the leverage of the longer rib was 62,700 lbs.; so nicely were the two ribs balanced, that by the most trifling addition or diminution of weight, they could with facility be raised or lowered. The following are the principal dimensions of the two ribs and the pier:—

The size of the pier on a level with the ground, is ten feet by four feet, which stands on pieces of three inch Yorkshire paving stone, let into the ground only eight inches below the surface; the height of the pier is eight feet, which diminishes gradually from the bottom to the top, and forms the abutment, or a centre, upon which the two ribs were counterpoised; the spandrell of the two ribs is one foot six inches thick, and, as will be seen by the drawing, is formed of a series of arches; the superstructure forming the cornice, and also the soffit of the arch, are three feet six inches wide, as shown on the plan, fig. 2, and section, fig. 5; the thickness of the arch is one brick and a half, or thirteen and a half inches; the span of the shorter rib is thirty feet, and the longer rib sixty feet.

The materials were composed of the best picked grey-stocks and Roman cement (manufactured by Messrs. Francis and White), mixed with an equal proportion of clean Thames sand.

The advantages of this system of bridge-building are, that one, two, or more arches, may be built over a river or a road, without any obstruction to the navigation or traffic, by advancing the brickwork from the pier or abutment equally, until they arrive at the centre allotted for the key-stone; it also saves the heavy expenses of centering, which is generally a very formidable item in the cost of bridge-building.

Mr. Brunel proposes to construct a bridge, by carrying across the river or road two ribs, similar to the experimental arch, which must be gradually advanced from the piers or abutment until they arrive at the central space left for the key-stone: if it should be found that the two ribs are not perfectly level, or in a straight line, they may be easily made so, as there is a degree of flexibility in the rib, which allows the arch to be raised or lowered, by adding to or taking off weights on the counterbalancing rib, as shown in fig. 1, and the two ribs may be as easily adjusted to a straight line; when they are thus properly adjusted, the key-stone is to be fixed, as shown in fig. 3; when that is done, the counterbalance weights may be removed. After one rib is carried across, the work is to be extended, by adding a nine-inch rim of brick-work set in cement, on each side of the rib, which will, on account of the adhesive qualities of the cement, unite very firmly to the first rib that was carried over. When one rim is thus completed, another rim is added, and so on until the intended width of the bridge is completed. If the counterbalancing rib, as shown in fig. 1, be carried forward simultaneously, and to the same extent as the adjacent rib, there will be no necessity for counterbalancing weights, which are only required when one rib is shorter than the adjoining one.

Since writing the preceding paper, we received a letter from Mr. Brunel, informing us that the arch had fallen down, and offered to give us his assistance and any information that we thought would be useful for the Journal; we accordingly hastened to the spot, and took a sketch of the arch as it appeared immediately after the fall, and previously to any part being removed. It suddenly broke down at a quarter past three o'clock, P.M., on the 31st of January, 1838. The sketch, fig. 4, represents the present remains and the nature of the different fractures. We will now proceed to explain the causes of the arch falling, which had stood for nearly two years, without any appearances of failure or fracture, supported on the pier only by its own equilibrium.

In the first place, it was never intended by Mr. Brunel, when he decided upon making the experiment, to carry it to the extent he did, consequently he provided a very slight foundation and pier. Secondly, a gasometer was erected immediately contiguous to the shorter rib, and the excavation for it abutted close to the pier. Thirdly, a trench was dug in front of the pier, during the late frost, for laying down some pipes to the gasometer, and when the thaw came on, the ground was supposed to have given or yielded. Fourthly, a north-easterly wind, blowing very strong against the unsheltered and longer rib (and the ground immediately adjoining the trench yielding by the thaw), the arch lost its equilibrium, and fell with a tremendous crash; and strange to say, so great was the tension of the iron, and adhesion of the cement, that notwithstanding the height of the fall, the entire fabric was not disturbed, but at the respective additions, as shown in the drawing, fig. 4.

So confident is Mr. Brunel of the principle of construction and the strength of cement, that he is of an opinion that even the aid of iron hooping is not necessary in the construction, and that hooping sticks may be in like manner substituted, by being first pitched, and then sprinkled with coarse sand, or brick rubbish, and well lapped over at their ends; or even New Zealand flax, laid together or knotted in long bands, pitched, sanded, strained tight, and laid in the work between the layers, might be used in lieu of the iron hooping, which Mr. Brunel is of opinion will answer every purpose until the key-stone is applied, which, of course, should in all cases, for the first rib, be as speedily as possible.

BALLARD'S ICE-BREAKING BOAT.

Much gratification was afforded to many of the inhabitants of Ledbury, last week, by witnessing the operation on the Herefordshire and Gloucestershire Canal of an ice-breaking boat, lately invented by Mr. Steven Ballard, engineer. Long pieces of timber, cased with iron, were fixed on the front of the boat; these timbers project before the boat, and form an inclined plane, sloping upwards from the under edge of the ice to near the middle of the boat. By these means, when the boat is drawn forwards, the ice is forced upwards instead of downwards, as is the usual way of breaking; and it is found the ice breaks remarkably easy when thus lifted from the water. The boat, with its apparatus, was drawn along the canal by two horses at a brisk pace, and the ice, which was in some places upwards of four inches thick, was ploughed up with great facility. The appearance of the boat when in motion, with the large pieces of ice continually rising over the front and falling on the sides, was very pleasing and interesting. Mr. Ballard has practised the method of breaking ice by forcing it upwards for some time past, but never with a boat and apparatus constructed purposely for this method before this winter. It is calculated that one horse will do as much work, with a machine of this kind, as four in the common way. Several boats loaded with coal were lying ice-bound at Over, near Gloucester, and in other parts of the canal, which were liberated, and followed the ice-boat into the basin of the Ledbury wharf, affording a useful supply of fuel to the inhabitants of the town and neighbourhood at the present inclement season.—*Birmingham Advertiser.*

REVIEWS.

The Churches of London, Nos. XIII. and XIV. By George Godwin, Jun., Architect, Associate of the Institute of British Architects; assisted by John Britton, Esq., F.S.A. London: 1838. C. Tilt.

This work still progresses with the same spirit and good taste as the former numbers, which we have previously noticed. No. XIII. contains the views and exteriors of St. Dunstan's in the West and St. Michael's, Cornhill; accompanying the description of St. Dunstan's is a spirited sketch of the old church, as it appeared in 1739. No. XIV. contains an external and internal view of St. Alban's, Wood Street, accompanied with some very proper remarks respecting Sir Christopher Wren, for having built "the church entirely different in style to the tower, which was standing; or why, having built the church, he did not afterwards, when called on to erect the tower, design that in conformity with it." There is also in this number a very neat engraving of St. Augustine's, Watling Street. Mr. Godwin has been particularly happy in selecting good points of sight for his perspective views, embracing the most interesting parts of the edifice.

A Practical Essay on the Construction and Management of Steam Engine Boilers.

A second number of this very clearly written book is before us, with a notice that Part III. will appear early in February, completing the work.

The following observations are well expressed, and we join our recommendation to that of the author, that railway directors would pay more attention than they have hitherto done to the suggestions of that class of mechanics who understand the method of carrying out the plans they propose, and not link themselves, so much as they are in the habit of doing, to the theories and crude observations of mere professors:—

It is a fact of the very utmost importance, and deserves the attention of those interested in railway speculations, that the very large item of expenditure in the reports of the Liverpool and Manchester Company, under the head of locomotive power account, varying from 30 to £40,000 per annum, is, in part, the result of want of sufficient boiler room. In saying this, it is not meant that larger boilers than those at present in use by that company are at all practicable on their line of railway; and much less is it my intention to cast the least reflection on any part of the direction, for there has been no lack of zeal in every one concerned in the management, to adopt every possible expedient that promised any chance of abatement under this head of disbursements; it is only mentioned to show the necessity of railway directors, generally, attending more to this point. Science has, as yet, done little or nothing for them; indeed the common fault of railway directors is too great a tendency to adopt the suggestions of mere scientific gentlemen, or the schemes of amateur engineers, because their ideas happen to be clothed in a scientific dress, in preference to plain, practical, and inexpressive improvements of a less ostentatious character.

We direct attention to the following statements of the author, connected as they are with the contrivances of a most ingenious mechanic, Mr. Hackworth, of Darlington.

Notwithstanding that the boilers of the locomotive engines on the Stockton and Darlington railway have been generally modifications of the old, or Trevethic plan, with a much greater capacity in proportion to the heating surface, than the multiflue boiler of Mr. Booth, and, therefore, generally considered to be on a less economical principle as to the application of heat, it is well known, that the cost to the company for drawing each ton per mile on the level, is not one half of what it is upon the Liverpool and Manchester line. The fact is certainly not in favour of high speed and high pressure; the speed of the Darlington locomotive being about twelve to fifteen miles an hour, which appears to be the velocity that gives the *maximum of useful* effect, while the pressure of the steam is only about forty pounds on the square inch. And it may here be observed, that I have had an opportunity of ascertaining, from a long series of very careful experiments, that even this pressure is still higher than that which is found to produce the best possible effect in a stationary engine, when working without either governor or throttle valve, as is the case with locomotives.

The superior economy of the Durham engines, is, no doubt, in part owing to the use of coal instead of coke, and not being compelled to burn their smoke (as they are obliged to do on most of the Lancashire railways), and this fact, it may be observed by the way, says nothing in favour of smoke-burning. It may also be stated, that but for the invention of the blast pipe, by Mr. Hackworth, of Darlington, which, in conjunction with Mr. Booth's boiler, at once doubled the efficiency of the locomotive engine, the prevention of smoke on railways would probably still present as great a difficulty as it yet does in factories.*

The author, in an extensive note to the above paragraph, seems to consider our observations upon the former part of his work, when speaking of the priming of boilers, in consequence of the accumulation of dirt, as scarcely borne out, in that we are not acquainted with "the preventive means—namely, the various mechanical methods of cleaning boilers without stopping them." Our observations were directed to the case of locomotive boilers, and we plead guilty to an ignorance of any practicable methods of cleaning such, or indeed any other boilers, without stopping; certainly the author has not pointed them out, for the various methods spoken of in page 63 and following, according to his own showing, fail in this effect, on account of the trouble attending the cleaning the boilers by hand in the usual way; but even if these were ever so successful for a factory boiler, they are wholly inapplicable to a locomotive; if, therefore, there be other means not expressed in his book, we shall be happy to receive them, and lay them before our readers, for we have never known a locomotive run for six days consecutively, with the very best water, but required to be cleaned out thoroughly, or the engine could not work.

The tendency of the water to rise into the cylinder, is always considerably promoted by the very usual situation of the steam pipe at the back end of the boiler; and this arises from the circulation of the water, which causes a uniform current at the surface, to set in the direction of the length of the boiler from the front end to the back. We may also here observe, that the presence of some kinds of dirt in the water, particularly if it be of a glutinous or mucilaginous nature, will cause the boiler to prime, whatever may be the amount of steam room. A small quantity of soap has a wonderful effect in this way; for all such cases, however, there are well known means of prevention, which will come more properly under our consideration in another chapter.

The following observations deserve attention:—

From what has appeared we may safely assume, that the space for *steam* in a boiler *ought not to be less* than half a cubic yard per horse power, and that the space for *water* certainly *ought not to be more*: therefore, generally, a cubic yard may be stated as the necessary capacity of boiler, for each horse power.

In enunciating the above proposition, I disclaim any right to being its first promulgator; and who first originated it, I have not been able to learn; I only know that it has been a current saying amongst the engineers in the neighbourhood of Newcastle-upon-Tyne, that a good steam-engine, ought to have an area of piston equal to twenty-seven circular inches per horse power, while the boiler ought to have twenty-seven cubic feet for the same. This is, probably, one of those maxims which occasionally become established in any trade where there is a good deal of practice, and it is, at least, as old as the first introduction of Boulton and Watt's patent engines to the collieries, in the counties of Durham and Northumberland. * * *

It is considered by bricklayers who have had the most practice, that in an engine chimney from twenty-four to thirty yards high, the common rule of making them twenty inches square inside at the top (400 square inches area) for each 20 horse boiler, is a good proportion. In Manchester, where, until lately, the engine chimneys were from twenty-four to thirty-six yards high, I always found the velocity of draught to be nearly proportional to the capacity of the chimney, reckoning by its narrowest dimensions. I have since observed, that the draught *is not improved* by raising the chimney much above forty or fifty yards, unless the width is also increased in a certain ratio. On the other hand I have also observed, that in chimneys under twenty yards high, if the width is greater than the above proportion, the draught is worse for it. At all factory chimneys, I would strongly recommend the use of the pressure or draught gauge, an instrument of as much use, in testing the effect of any alterations, as the water gauge, or even the steam gauge itself.

Rules are given, under the head of "resetting boilers," to which we direct attention; we do not quote them, as our extracts have been already too numerous.

We fully sympathise in the following remarks, and give our vote most heartily in favour of practical experience, *versus* the empty pretension of the mere bookworm theorist.

In choosing this method of investigation, and endeavouring to inculcate principles by applying them to practice, I am fully aware of the usual charge, as well as of the danger, of drawing conclusions from isolated facts and experiments; it may, however, be said, that although this empirical mode of instruction, by example rather than precept, may not be liable to very serious objections, yet that at any rate is is "unscientific;" however, it will do well enough, perhaps, if it is not "un English," for we are told that Brindley raised the first canal aqueduct in the world, in defiance of all the rules of science of the day; and in the same locality we have seen Stephenson successfully lay an iron railway across Chat Moss, quite contrary to the opinions of all the learned; and to compare small things with great, if we succeed in assisting the English manufacturer, or artisan, to obtain the greatest amount of power from a steam engine, at the least possible expense, we may safely continue to leave to the French and Ame-

* The original "*Sanspareil*" of Mr. Hackworth, which all but successfully competed for the prize at the opening of the Manchester and Liverpool Railway, may still be seen regularly working on the Bolton and Leigh Railway, apparently not much worse for seven years constant work, the boiler never having required any essential repair, while all its contemporary rivals that have escaped the fate of the "scrap heap," have been re-made, and mended over and over again, since the celebrated race at Rainhill—a fact which goes far to prove that the principle of this engine has not been so very much improved upon, except that it is not so well calculated for burning coke as coal. The Sanspareil may frequently be seen at the Kenyon Junction, waiting for the Bolton trains from Liverpool, and plans of it may be seen in Dr. Lardner's Work, Hebert's Mechanics' Encyclopædia, Wood on Railroads, the Mechanic's Magazine, and many other works.

nean writers, all scientific speculations on the subject of steam, as more suited to the closet of the philosopher than an English workshop or manufactory.

We had determined to spare further extracts, but the following is so much to our taste, and we think will be so useful, that we cannot resist adopting it into our pages.

The boiler we are about to examine has $17 \times 7 = 119$ square feet of water surface, and as it is supposed to have six square feet per horse power, it is equal to $119 \div 6 = 19{\cdot}83$, or nearly 20 horse power; if five square feet be allowed, then it is $119 \div 5 = 23{\cdot}8$, or nearly 24 horse power.

As estimating the power of a waggon boiler by the superficial extent of water surface is the customary mode in this district, and is in reality the best, when the boiler is at work and an exact measure of the heating surface cannot be obtained, we shall here give the proper formula for effecting that purpose by the slide rule:—

A	Gauge point, or square feet of water surface per horse power.	Width of Boiler in feet.
B	Length of the Boiler in feet.	Horse power.

An example for the above boiler is as follows:—

A	Gauge point = 6	Width 7 feet.
B	Length = 17 feet.	Answer 20 horse power.

If we take five square feet per horse for the gauge point, then it is—

A	Gauge point = 5	Width 7 feet.
B	Length = 17 feet.	Answer 24 horse power.

My object in giving these examples is to assist in facilitating the use of the slide rule among working mechanics, many of whom have complained to me, and justly, that the usual teachers of the use of this cheapest and best of calculating machines, begin by putting them into "dismals," which is far too sleepy a system for men who have worked hard all day.

Having digressed thus far, we shall merely add a formula for estimating the power of a steam engine from the diameter of the cylinder, without any given number of circular inches area per horse power:—

C	Gauge point, or circular inches area of piston per horse power.	Horse power.
D	Ditto	Diameter of Cylinder.

EXAMPLE:

C	Horse power... ... 18	Gauge point = 27
D	Diameter of Cylinder 22 inches	Ditto = 27

The intelligent mechanic will perceive that he can adopt any gauge point he likes best, or obtain one by measuring the diameter of the cylinder of any engine he approves of, by the same kind operation. Suppose, for instance, that a Boulton and Watt forty horse engine has a cylinder of thirty-two and a quarter inches in diameter, the gauge point is found as follows:—

C	Gauge point = 26	Power ... ... 40 horses.
D	Gauge point = 26	Diameter of Cylinder = $32\frac{1}{4}$ inches.

The rest of this number is occupied with rules and considerations for the best form and dimensions of fire-grate, with a chapter on *preventing circulation;* explaining Mr. Anthony Scott's patent apparatus for saving fuel, by placing hollow vessels, variously modified, within the boiler, displacing the water, and thus leaving a smaller amount of active, or boiling water, to be in contact with the heating surfaces; it is needless for us to explain this plan further, as, although saving fuel, it was found troublesome in practice, and has consequently fallen into disuse. We have gone through this book with much pleasure and instruction, and heartily recommend its attentive perusal to our readers.

The History and Antiquities of the Collegiate Church of Southwell, with Views of the Interior and Exterior, Plans, Sections, &c. By T. H. Clarke, Architect. Imp. 4to. Part I. Lond. 1838.

In our notice of another publication by the same author, we spoke briefly of the subject of the present work, which is certainly well selected, the building being a very interesting specimen of its class and the period to which it belongs, and deserving more attention than it has generally received hitherto. How it is described in Dickinson's History of Southwell we know not, but understand most wretchedly, in regard to the engravings, and are therefore not surprised to see it thus again brought forward. At present, indeed, we can judge but imperfectly of this new work, because the part before us contains no letter-press, and, with the exception of that representing the interior and exterior of one of the compartments of the choir, the plates here given consist only of views. These engravings are on stone, and, we presume, executed by the artist himself, for they exhibit more of spirit and effect, than of ability in the management of the tints. We are of opinion, that the style of lithography here chosen is not the very best for the purpose, since it partakes too much of the chalk manner, which, although favourable enough for subjects which admit of being treated in a free sketchy style, is not so well calculated for those which demand extreme precision of drawing, and to have all the forms clearly defined, even in the shadowed parts. That the utmost accuracy and delicacy of outline is attainable on stone as well as copper, we are convinced by many specimens of outline engraving so executed, which we have met with in German architectural plates; and, if we mistake not, those in Collie's "Glasgow Cathedral" are very ably drawn in the same manner. We are of opinion, therefore, it would have been better had Mr. Clarke treated his drawings, if not entirely as outlines, as principally such, with only indications of shadow in parts, just sufficient to produce relief.

At the same time, we are aware that many—we do not say architects—will no doubt prefer the mode he has adopted, as being the more picturesque. In this respect, the view of the north transept and chapter house is the best, owing to the sparkling distribution of light and shade. The general view of the east end of the church, on the contrary, and the north porch, are not so satisfactory. In the former, the perspective appears somewhat faulty, and in the other, greater depth of shadow is required within the porch itself, in order to bring it out and relieve it from the rest. Judging from the plate here given of the choir, we imagine that the geometrical drawings, which, after all, are those of primary importance, will be much better executed than the others, for this leaves very little, if anything, to be desired in regard to distinctness; and here, we may remark, the shadows are confined to the apertures of the windows externally, and the openings of arches within.

The style of this part of the interior is singularly elegant. The arches and their piers bear a great resemblance to those of the nave of Lincoln Cathedral; and the triforium range above them, consists of very lofty clerestory windows, which are seen through, instead of above them, a very unusual, if not unique arrangement. We look forward to the other sectional plates of the building with some degree of impatience, being assured this edifice must afford much that is particularly worthy of notice, and deserving of study, if properly made use of.

An Historical Sketch of the Royal Exchange, chiefly compiled from Stowe, and other Authorities. By Samuel Angell.

Mr. Angell has taken considerable pains to condense, in a small pamphlet, a faithful history of the building, together with an account of the various alterations which have occurred; illustrated with seven engravings, exhibiting the metamorphosing of the building from the foundation, in 1566, up to the last alteration made under the direction of Mr. George Smith.

A New Theory of the Steam Engine, and Calculation, by means of it, of every kind of Steam Engines, Stationary or Locomotive. By the Chev. G. De Pambour.

The above title describes the nature and objects of a Memoir read before the French Institute, at Paris, at various times, from February, 1837, up to the present period. An analysis of this paper is publishing in "Weale's Scientific Advertiser."

PART I.—Proofs of the inexactitude of the ordinary methods, and exposal of the proposed theory.

Section 1 is occupied exclusively in detailing the method usually adopted in this country to determine the power of an engine, by the multiplication of the pressure, area of the piston, length and number of strokes per minute, and representing this in horse powers.

Section 2 is devoted to the display of reasons why the usual mode of calculation is defective.

§ 2. *First objection against this method of calculation.*—This mode of calculation is liable to many objections, but we limit ourselves to the following:—

The coefficient adopted to represent the ratio of the practical effects to the theoretical, varies from $\frac{1}{2}$ to $\frac{2}{3}$, according to the various systems of steam-engines; that is to say, that from $\frac{2}{3}$ to $\frac{1}{2}$ of the power exerted by the machine is considered to be absorbed by friction and divers losses. Not that this friction and these losses have been measured and found such, but merely because the calculation that had been made, and which may be inexact in principle, wanted so much of coinciding with experience.

Now it is easy to obtain conviction, that the friction and losses which take place in a steam-engine can never amount to $\frac{2}{3}$, nor to $\frac{1}{2}$ of the total force it develops. It will suffice to cast an eye on the explanation attempted, with regard to this, by Tredgold, who follows this method in his treatise on steam-engines. He says (art. 367), that, for high-pressure engines, a deduction of four must be made from the *total* pressure of the steam, which amounts to a deduction of five on the ordinary *effective* pressure of such engines; and to justify this deduction, which however is still not enough to harmonize the theoretical and practical results in many circumstances, he is obliged to estimate the friction of the piston, with the losses or waste, at two-tenths of the power, and the force requisite for opening the valves and overcoming the

friction of the parts of the machine, at six-hundredths of that power. Reflecting that these numbers express fractions of the gross power of the engine, we must readily be convinced that they cannot be correct; for, in supposing the engine had a useful effect of 100 horses, which, from the reduction or coefficient employed, supposes a gross effect of 200 horses, 12 would be necessary to move the machinery, 40 to draw the piston, &c.! The exaggeration is evident.

Besides, in applying this evaluation of the friction to a locomotive engine, which is also a high-pressure steam-engine, and supposing it to have 2 cylinders of 12 inches diameter, and to work at 75 lbs. total pressure, which amounts to 60 lbs. effective pressure, per square inch, we find that from the preceding estimate, the force necessary to draw the piston would be 5,650 lbs., whereas our own experiments on the locomotive engine, the *Atlas*, which is of these dimensions, and works at that pressure, demonstrate that the force necessary to move, not only the two pistons, but all the rest of the machinery, including the waste, &c., is but 42 lbs. applied to the wheel, or 218 lbs. applied on the piston.

It is then impossible to admit, that in steam-engines the friction and losses can absorb the half, nor the third, much less the $\frac{2}{3}$ of the total power developed; and yet there do occur cases wherein, to reconcile the practical effects with the theoretical ones thus calculated, it would be necessary to reduce the latter to the fourth part, and even to less; and what is more, it often happens, that the same engine which in one case requires a reduction of $\frac{3}{4}$, will not in other cases need a reduction of more than about $\frac{1}{3}$. This is observed in calculating the effects of locomotive engines at very great velocities, and afterwards at very small ones.

The instances adduced by the author are exclusively those of locomotives, whose velocities are perpetually varying; and he quotes Tredgold, who shapes his rules for engines whose velocities are constant. The average velocity of a low-pressure engine should never exceed 220 feet in a second, excepting for engines of a very long stroke, when it may be a little increased, because, as these engines act by the gravitation of a column of steam, whose height is equal to that of the atmosphere, a variation from this velocity in any considerable degree either way would materially injure the effect: it has been found by Smeaton, that to produce the maximum effect, the velocity of the circumference of a water-wheel should not exceed three feet per second; so the same rule must apply to the action of a column of steam, which being an elastic body, and adapting itself more readily to the conditions of the machine, is allowed a velocity about one-fifth higher in consequence. Again, in calculating the powers of an engine, the result required is the limit of the greatest load it is capable of moving at the required velocity; this is another reason why the question of the supply of steam, which is more or less a constant quantity, need not enter into the calculation.

In a low-pressure engine, the steam being employed merely as a means of producing a vacuum, if it were possible to keep up steam in the boiler at one pound per square inch, instead of from five to seven (the usual pressure), without fluctuation, the action of the engine would be very much improved by the operation. We have seen a low-pressure engine attached to a high-pressure boiler, in which the steam ranged to thirty pounds per square inch; upon the steam pipe was fixed a self-acting apparatus, which reduced the steam to one pound per inch in the cylinder, and the improvement in its action over that produced from the former boiler, of from five to seven pounds pressure in the common way, was wonderful, both in fuel and the perfection of the vacuum.

§ 3. *Formulæ proposed by divers authors to determine the velocity of the piston under a given load, and proofs of their inexactitude.*—We have said that this problem was not resolved by the foregoing method. The following are the attempts made to that end by another way. Tredgold, in his treatise on steam-engines (art. 127 and following), undertakes to calculate the velocity of the piston from considerations deduced from the velocity of the flowing of a gas, supposed under a pressure equal to that of the boiler, into a gas supposed at the pressure of the resistance. He concludes from thence, that the velocity of the piston would be expressed by this formula,

$$V = 6{\cdot}5 \sqrt{h}\,,$$

in which h stands for the difference between the heights of two homogeneous columns of vapour, one representing the pressure in the boiler, the other that of the resistance. But it is easily seen, that this calculation supposes the boiler filled with an inexhaustible quantity of vapour, since the effluent gas is supposed to rush into the other with all the velocity it is susceptible of acquiring, in consequence of the difference of pressure. Now such an effect cannot be produced, unless the boiler be capable of supplying the expenditure, however enormous it might be. This amounts consequently to supposing that the production of steam in the boiler is unlimited. * * *

It occurs to us, that the author does not state Tredgold's formula with the exactness due to it. Tredgold, as we have before remarked, forms his rule for condensing engines, whose velocity must, under every condition of the load, remain uniform, or the effect will be injured. His theory of calculating the velocity of the piston, from considerations deduced from the flowing of a gas, &c., is most correct, and his formula correct also: the coefficient 6·5 is a deduction due to the friction through the pipe, derived from experiment; and he explains (article 138), "the quantity of steam generated, may be considered equal to the quantity consumed, in the same time, and that the boiler is of sufficient capacity to admit of its being taken at intervals without a sensible loss of elastic power; and as these conditions are essential to a good engine, we shall consider them to be fulfilled."

Thus, the observations indulged in by the author, to disprove the accuracy of Tredgold's formula, are not warranted by the circumstances of the case, because, if double, or treble, or any other quantity of steam were generated beyond that required to produce the effect, it would be blown off to waste.

In his treatise on railways (page 83), Tredgold proposes the following formula, without in any way founding it on reasoning, or on facts:—

$$V = 240 \sqrt{\frac{lP}{W}}\,,$$

in which V is the velocity of the piston in feet per minute, l the stroke of the piston, P the effective pressure of the steam in the boiler, and W the resistance of the load. But as this formula makes no mention either of the diameter of the cylinder, or of the quantity of steam supplied by the boiler in a minute, it clearly cannot give the velocity sought; for if it could, the velocity of an engine would be the same with a cylinder of 1 foot diameter as with a cylinder of 4 feet, which expends 16 times as much steam. The area of heating surface, or the vaporization of the boiler, would be equally indifferent: an engine would not move quicker with a boiler vaporizing a cubic foot of water per minute, than with one that should vaporize but $\frac{1}{4}$ or $\frac{1}{20}$. Hence this formula is without basis.

Wood, in his treatise on railways (page 351), proposes the following formula also, without discussion,

$$V = 4 \sqrt{\frac{l\,P}{W}}\,,$$

where V is the velocity of the piston in feet per minute, l the length of stroke of the piston, W the resistance of the load, and P the surplus of the pressure in the boiler, over and above what is necessary to balance the load W. This formula being liable to the same objections as the preceding, is also demonstrated inadmissible *à priori.*

The above observations we think just. It has been shown by Watt, and the fact has been noticed by almost every writer upon the steam-engine since, that the evaporation of a cubic foot of water per hour is the identical measure of a horse power; and it is singular that, in the discussion which the Cornish engine question has undergone, this simple mode of testing the performance of one species of boiler over another, should not have been resorted to. The boiler is *cæteris paribus* the depository of power, the engine is a mere adaptation of means to render this power available; therefore, we have been accustomed in our practice, in connexion with locomotives, to take the evaporating power of the boiler in cubic feet per hour, as the exact measure of the power of the engine. We readily concede to M. Pambour, that the usual mode of estimating the power of engines, as applied to locomotives, is wholly inadmissible, and this is only admitting what has been well known in this country, amongst practical men, ever since the introduction of the locomotive.

§ 4. *Succinct exposition of the proposed theory.*—After having made known the present state of science, with regard to the theory and estimation of the effective power of steam-engines, it remains to exhibit the theory we apply to them ourselves.

It is well known, that in every machine, when the effort of the motive power becomes superior to the resistance, a slow motion is created, which quickens by degrees till the machine has attained a certain velocity, beyond which it does not go, the motive power being incapable of producing greater velocity with the mass it has to move. Once this point attained, which requires but a very short space of time, the velocity continues the same, and the motion remains uniform as long as the effort lasts. It is from this point only the the effects of engines begin to be reckoned, because they are never employed but in that state of uniform motion; and it is with reason that the few minutes, during which the velocity regulates itself, and the transitory effects which take place before the uniform velocity is acquired, are neglected.

Now, in an engine arrived at uniform motion, the force applied by the motive power forms strictly an equilibrium with the resistance; for if that force were greater or less, the motion would be accelerated or retarded, which is contrary to the hypothesis. In a steam-engine the force applied by the motive agent is nothing more than the pressure of the steam *against the piston*, or *in the cylinder*. The pressure therefore in the cylinder is strictly equal to the resistance of the load against the piston.

Consequently the steam, in passing from the boiler to the cylinder, changes its pressure, and assumes that which is represented by the resistance of the piston. This fact alone exposes all the theory of the steam-engine, and in a manner lays its play open.

From what has been said, the force applied on the piston, or the pressure of the steam in the cylinder, is therefore strictly regulated by the resistance of the load against the piston. Consequently calling P′ the pressure of the

steam in the cylinder, and R the resistance of the load against the piston, we have as a first analogy,

$$P' = R.$$

To obtain a second relation between the data and the quæsita of the problem, we will observe that there is a necessary equality between the quantity of steam produced, and the quantity expended by the machine; the proposition is self-evident. Now, if we express by S the volume of water vaporized in the boiler per minute, and effectively transmitted to the cylinder, and by m the ratio of the volume of the steam generated under the pressure P of the boiler, to the volume of water which produced it, it is clear that

$$m\,S$$

will be the volume of steam formed per minute in the boiler. This steam passes into the cylinder and there assumes the pressure P'; but if the cylinders and steam pipes are properly protected against all the effects of external refrigeration, the steam preserves its temperature. Hence, in passing from the boiler to the cylinder, or from the pressure P to the pressure P', its volume increases in the inverse ratio of the pressures.

This is a very elegant exposal of the theory proposed, borne out by the reasoning contained in paragraph 5; but a great deal of the argument is used under the mistaken comparison of the action of low-pressure and high-pressure engines, as noted in our former remarks.

To apply our formula with reference to the same problem, viz.

$$a\,R = \frac{m\,S\,P}{a\,v},$$

we have nothing more to do than to substitute for the letters their value, taking care to refer all the measures to the same unit. In making then these substitutions, which give $P = 69 \times 144$ lbs., $m = 413$, $a = 1{\cdot}32$, and observing that the effective vaporization of the engine has been $S = {\cdot}80$ cubic feet of water per minute, we find,

1st case.—Effort applied by the engine at the given velocity, according to our theory, $\frac{413 \times {\cdot}80 \times (69 \times 144)}{298}$ . . . . . 11,002 lbs.

Effect produced, including friction and resistances, as above 10,561

Difference 441

2nd case.—Effort applied by the engine at the given velocity, according to our theory, $\frac{413 \times {\cdot}80 \times (69 \times 144)}{434}$ 7,562

Effect produced, including friction, &c. 7,707

Difference 145

Mean difference of the two cases . . . . 293 lbs.

It appears, then, that by this method, the useful effect is found with a difference only of 293 lbs., a very inconsiderable difference in experiments of this kind, wherein so much depends on the management of the fire.

The application of the new mode of calculation is here satisfactorily displayed; but we think, for all practical purposes, the power of an engine may be sufficiently and accurately determined by the quantity of water evaporated alone, as the engineer, if his boiler produce more steam than is needed, has only to regulate his fire accordingly, or the boiler might be made very easily to regulate itself, the same as in a stationary engine.

2°. To continue the same comparison of the two theories, let it be required to calculate what quantity of water per minute the boiler ought to vaporize, to produce either the first effect or the second. The method followed by the ordinary theory, again consists in previously supposing that the volumes described by the piston has been filled with steam at the same pressure as in the boiler, and then in applying to it a fractional coefficient to account for the losses.

Now, in the 1st case, the volume described by the piston at the given velocity, is $1{\cdot}32 \times 298 = 393$ cubic feet. Had this volume been filled with steam at the pressure of the boiler, it would have required a vaporization of $\frac{393}{413} = {\cdot}95$ cubic feet of water per minute.

But the real vaporization was but ·80; wherefore, in the first case, the coefficient necessary to lead from the vaporization indicated by the ordinary calculation, to the real vaporizaton, $\frac{{\cdot}80}{{\cdot}95} = {\cdot}84$.

In the second case, we find in the same manner, that the coefficient should be ·57, whence, in this problem, as in the preceding one, no constant coefficient whatever can suffice.

Performing, however, the calculation with the mean coefficient, ·70, we find,

1st case.—Vaporization per minute, calculated by the ordinary theory, with the coefficient, ·70, $\frac{1{\cdot}32 \times 298}{413} \times {\cdot}70$ . . . . ·67

Real vaporization . . . . ·80

Error . . . . ·13

2nd case.—Vaporization per minute, calculated by the ordinary theory, with the coefficient, ·70, $\frac{1{\cdot}32 \times 434}{413} \times {\cdot}70$ . . . . ·97

Real vaporization . . . . ·80

Error . . . . ·17

The mean error committed is then ⅕ of the vaporization, and being as it is a mean, it may, in extreme cases, become ⅓, or amount to half of the whole vaporization.

This is the error committed in seeking a coefficient *expressly* for the vaporization. But when the coefficient, determined in the preceding case, that is, by the comparison of the theoretical and practical effects, is used as a divisor, as by many authors it is, much greater errors are induced, which we will show by an example farther on.

In our theory, on the contrary, the vaporization necessary to set in motion the resistance a R at the velocity v, is given by the formula

$$S = \frac{a\,R \times v}{m\,P}.$$

We have then,

1st case.—Vaporization calculated from our theory, $\frac{10{,}561 \times 298}{413 \times (69 \times 144)}$ . . ·77

Real vaporization . . . . ·80

Difference . . . . ·03

2nd case.—Vaporization calculated from our theory, $\frac{7707 \times 434}{413 \times (69 \times 144)}$ . . ·82

Real vaporization . . . . ·80

Difference . . . . ·02

3°. Lastly, in the case of finding the velocity of the piston, supposing the resistance to be given, any method similar to the ordinary one must inevitably lead to errors; but we must dispense with comparison, since this problem has never been resolved, and we shall therefore in this case merely show the verification of our own theory. The formula relative to this problem is

$$v = \frac{m\,S\,P}{a\,R}.$$

We find then,

1st case.—Velocity of the piston in feet per minute, calculated from our theory, $\frac{413 \times {\cdot}80 \times (69 \times 144)}{10561}$ 311

Real velocity 298

Difference 13

2nd case.—Velocity of the piston from our theory, $\frac{413 \times {\cdot}80 \times (69 \times 144)}{7707}$ 426

Real velocity 434

Difference 8

It consequently appears, that in each of the three problems in question, our theory leads to the true result, whereas the ordinary theory, besides that it leaves the 3rd problem unresolved, may, in the other two, lead to very serious errors.

It must be observed, although we coincide in the accuracy of the above, that a boiler must be formed to meet the extreme requirement of the engine, all the cases between this, and the least effect, must of course be matters of adjustment, and this extreme case will be the steepest gradient, the heaviest load the engine is required to drag over it, and the highest velocity up the ascent.

§ 7. *Of the area of the steam passages.*—There is yet one point which it is necessary to examine, and that is the area of the opening of the regulator.

The ordinary theory recognises in this opening an effect of great importance to the engine, since it affirms, that, by increasing or diminishing it, any desired pressure may be produced in the cylinder. Yet no means are given to ascertain that opening, and the calculation is always performed with the same coefficient, whatever that opening may be.

Before abandoning this comparison, we request attention to an effect, in calculating by the ordinary theory, which we have already mentioned, but which is here demonstrated, viz., that this calculation gives the same force applied by the engine in both the cases considered, notwithstanding their difference of velocity; and such will always be the result, since the calculation consists merely in multiplying the area of the piston by the pressure in the boiler, and reducing the product in a constant proportion. This theory therefore maintains, in principle, that the engine can always draw the same load at all imaginable velocities. Again we see, that, in the same calculation of the load or effort applied, the vaporization of the engine does not appear, which would imply that the engine would always draw the same load at all velocities, whatever might be the vaporization of the boiler, which is inadmissible.

We shall also remark, that in calculating by the ordinary theory the vaporization of the engine, no notice is taken of the resistance which the engine is supposed to move; so that the vaporization necessary to draw a given load would be independent of that load—another result equally impossible.

To these omissions, therefore, or rather to these errors in principle, are to be attributed the variations observable in the results given of the ordinary theory in the examples proposed. * * *

In the theory we propose, on the contrary, the opening of the regulator, or at least the effect it produces, are taken into account, though its direct measure does not ostensibly appear in the formulæ. To render this fact perfectly clear, we shall first establish what are the real effects of the regulator.

We shall first prove that the degree of opening of the regulator can have no influence on the pressure in the cylinder, but that it acts, on the contrary, only

on the pressure in the boiler; we shall afterwards show, that whatever be the degree of that opening, the formula will always account for it, and continue to give the true effect produced; finally, we shall examine what are, in each circumstance, the changes induced in the effect, by reason of the greater or less opening of the regulator. * * * *

As the total quantity of water vaporized in a given time may be directly measured by the supply, the question reduces itself to estimating that which is lost by the safety-valve, in order to subtract it from the former. This evaluation is readily made; first, by taking note of the height to which the valve is raised at the moment of the loss, which the length of the levers of the safety-valves, and the graduated scale with which they are furnished, render extremely easy; and, second, letting the regulator be completely closed, so as to force the whole of the steam produced to escape by the valve, and noting again the height to which the valve is raised. The proportion of the first elevation to the second will be the ratio of the vapour lost to the total vapour produced. This is the means we have used with locomotive engines. Should the evaluation not appear sufficiently precise, the waste vapour may be condensed in a separate vessel, and the quantity of water measured. It will always then be easy to know the *effective* vaporization of the engine; and consequently, by introducing it into the formulæ, we shall continue to have the true effect produced.

Here, again, is an unfair comparison of the two systems; the ordinary system invariably supposes a determinate and uniform velocity of the piston, in which case it is most true that, by increasing or diminishing the opening of the regulator, any desired pressure may be produced in the cylinder, because thus the density of the steam in the cylinder, and that in the boiler, may be made to coincide in any ratio; but the author, supposing that the piston is a safety-valve, and to be allowed any velocity the steam may impress upon it, supposes a case which never occurs in practice, not even in locomotives; if it were so, then of course the narrowing or opening the regulator could only affect the boiler, as the piston moving faster or slower, according to the quantity of steam admitted into the cylinder, the pressure in the cylinder will remain the same.

We have made large extracts from the above very interesting paper, and hope, for the satisfaction of English readers, that the entire memoir will soon appear in a distinct shape.

An Engraving of the Dutton Viaduct, on the Grand Junction Railway, over the Valley of the Weaver, from a Design by G. Stephenson, Esq., and erected under the direction of J. Locke, Esq. Wrightson and Webb, Birmingham.

This is a spirited and beautifully executed engraving, on steel, from a picture by Thomas Creswick, Esq., exhibiting that stupendous work of art. The Dutton Viaduct consists of twenty arches of solid stone, the span of each being sixty feet; the height from the water to the top of the parapet wall seventy-three, and the entire length over the valley 1,400 feet. The foreground of the landscape is very beautifully drawn, interspersed with figures, which give a lively and delightful effect to the scenery.

An Historical and Topographical Account of Cassiobury, the Seat of the Earl of Essex. By John Britton, F.S.A., H.M.R.I., B.A., &c. Folio. London: 1837.

Whether this is to be regarded as a posthumous work given to the world now that Mr. Britton is professionally defunct, or a resuscitation of his former publishing career, it cannot be termed one at all creditable to him, either on account of selecting such a subject for illustration, or for the mode in which he has thought proper to describe it, including in this latter sense the plates as well as the letter-press. The house itself exhibits about as tasteless and inconsistent an application of Gothic, as has been perpetrated in modern times on a similar scale; is, besides, a wretched jumble of that and other styles; and withal very badly planned within, as well in regard to display as to convenience as a residence. However, having made choice of it for better or worse, we conceive that Mr. Britton was bound to show it fairly and intelligibly; instead of which he takes care not to enlighten us too much, for all that he permits us to behold of it is two or three general, and we must say, huddled up views of it, the interior of the library and great cloister, and a ground-plan of one floor. There is not a geometrical elevation of any part, not a single section, not a single piece of detail; it is unnecessary therefore to add, that the work would be very imperfect and unsatisfactory, even were the views themselves well executed. Very far, however, from being so, they are exceedingly incorrect and tasteless, we might say slovenly, both in regard to drawing and to engraving. We say incorrect, because, however bad the forms and details may be, we cannot imagine them to be so vile as here represented. Since the library has been selected for an interior view, we must suppose that it is at least as handsome as any of the apartments; yet it is certainly a very common place, not to say vulgar room, fitted up in a style equally remote from refined elegance, or imposing dignity. Nevertheless, in the letter-press, every thing, as far as it is described or noticed at all, is painted *en beau*. On this occasion, Mr. B. is perhaps some less lavish of sugary terms than is his wont; in fact, as brief as in common decency he could be, in what he says of the house itself, carefully eschewing aught that might be taken for criticism on it. *En revanche*, he has dished up a strange rigmarolish chapter about Cassibelaunus, which, if it has very little to do with my Lord Essex's residence, might, *mutatis mutandis*, be made to serve for that of any other nobleman quite as well. We saw how matters stood when we read in the first sentence about Athens and Thebes. Really it is full time that a stop should be put to all that sort of inane, schoolboy pomposity, and commonplace hoisted upon stilts. It may sometimes be amusing, but then it is always at the writer's own expense; and in this instance we think that Mr. Britton has overdosed his readers with it. By very far the best thing in the books are the wood-cuts of the different cottages and lodges in the grounds, which, as vignettes, are sparkling and spirited enough. Yet these we apprehend will hardly reconcile the purchasers to paying three guineas for such a volume.

Public Works of Great Britain. Edited by F. W. Simms, C.E. London: John Weale, 1838.

In our last number we gave a hasty review of the important volume before us; we have since carefully perused the work, which, we are happy to say, fully confirms our previous remarks. It is, doubtless, one of national importance, and, if we mistake not, will become a standard book of reference for the profession. It contains upwards of 150 engravings, beautifully and accurately drawn, and reduced from the originals; each plate is in itself a study. We sincerely hope that both the editor and publisher will be amply repaid, for their labours, and the heavy expenses that must have been incurred in bringing out such a *stupendous* volume. We very earnestly recommend it to the notice not only of the profession, but to the public in general, who will derive, by an inspection and study of this work, some idea of the magnificent and noble works that are now progressing in Great Britain.

The volume is subdivided into four divisions, viz.:—

Division 1.—Railways.

Division 2.—Canals, Bridges, River-walls, and the Docks and Port of Liverpool.

Division 3.—Turnpike-roads, Iron, Steel, and Gas-works.

Division 4.—Survey of the Port of London.

It is our present intention to confine our remarks to the first division, which comprises the drawings of the principal works on the Birmingham, the Great Western, the Southampton, the Greenwich, the Croydon, the Birmingham, Bristol and Thames Junction, and the Glasgow and Gainkirk Railways. The first and principal portion of this division is that of the *London and Birmingham Railway*, which is now in a forward state of completion, and will be, when finished, a lasting monument of the skill, ingenuity, and taste displayed by the Engineer-in-Chief, Robert Stephenson, Esq.

The first plate, commencing the work, is that of the entrance to the Primrose-hill Tunnel: it is admirably engraved, the design is particularly well adapted for the situation, and displays considerable taste and judgment; the architectural character is original, and participates in that of the massive Italian rusticated style. The next plate we cannot write in the same terms of praise, as it but ill represents the two noble and well-proportioned chimneys belonging to the steam-engines at the Camden Town station, which stand, like the obelisks of the ancients, indicating the entrance to some great work, as in the present case. Here, may be considered the commencement of the railway, and the depôt for the transportation of all the goods, which will be forwarded from the manufacturing towns, or the great workshops of England, to the metropolis. The next plates show the depôt, and the admirable arrangements made at the London terminus, Euston-square and Camden Town.

In all great travelling establishments the utmost perfection in the multifarious arrangements becomes essential to prevent confusion, and to facilitate business. If order and precision had been found necessary in the smaller establishments to which we have hitherto been accustomed, how much more essential must it be to facilitate the traffic of so immense a concern as that of the London and Birmingham Railway, where, comparatively, such numbers of persons are going and returning at each departure and arrival of the trains, and where, without a most perfect system of management throughout its numerous details, business would be retarded, the passengers' goods mislaid or lost, and inextricable confusion would result. The fact, however, is far otherwise; the whole business is conducted with a precision resembling the movements of our most admirable machinery; the arrangements of the offices of the depôt or passenger station are well contrived, and upon a most magnificent scale. Plate 4 contains a ground-plan of the London station of this railway, at Euston Square; the grand entrance, as before observed, is now (October, 1837) in the course of erection; the principal or public carriage entrance leads to an area enclosed by a wall marked A A A, &c., thus separated from the various lines of railway, it must greatly tend to prevent con-

fusion. Beneath the colonnade are doors leading through the various offices to the departure stage, which is an admirably paved platform, from which the passengers pass into the various carriages; the arrows point the direction in which the departing and returning trains move. On the opposite side of the station an arrival stage or platform is erected, similar to the one above-named, and thus, by separating the arrivals and departures, another source of confusion is avoided.

The locomotive engines do not come to the station at Euston Square, but stop at that near the Hampstead Road, immediately on the north side of the Regent's Canal, nearly one mile distant. An inclined plane,* commences at Wriothesley Street Bridge, and terminates at the Regent's Canal; in returning, the trains *pass down* this inclination by the action of gravity, and their ascent on departure is effected by attaching them to an endless rope, which passes round a sheave sunk below the level of the ground near Wriothesley Street Bridge, and passes over a vertical sheave (Plate 5.) at the other extremity of the inclined plane, on the north side of the iron bridge over the canal; this sheave is also beneath the surface of the railway; the rope then passes round a horizontal sheave (called in the plan a tightening sheave) to another vertical one, or previously round a smaller intermediate vertical sheave, when a greater degree of friction is required; this brings the rope again above the surface, and in the direction of the first sheave at Wriothesley Street Bridge, thus constituting an endless rope. In order to give motion to the rope, two marine steam-engines, of sixty horse power each, are applied to turn the largest vertical sheaves on each line of railway; for it may be observed from the plan that two double lines of railway connect the Euston and Camden or Hampstead Road stations. In order to keep the endless rope always in a proper state of tension, there is an admirable contrivance which acts, in this case, as a spring; thus, the horizontal or tightening sheave (Plate 5) is fixed on a stage which is moveable, on a pair of rails (or railway) in the direction of the rope; from this stage a rope or chain passes over a roller into a well a little distance in its rear, and there suspends a counter-balancing weight; this weight is sufficient to draw the tightening sheave with considerable force towards the well, and thus keeps the rope in the requisite degree of tension, however the weights of the different attached trains may vary. The whole of these extensive works, of which the plan is represented at Plate 5, are beneath the surface of the railway, or underground, and therefore are invisible from above, with the exception of the two admirably proportioned chimneys which rise from the surface of the ground on each side of the railway to a towering height, and which have so imposing an effect. They are represented in perspective in Plate 3, as seen from the south or London side of the iron bridge which crosses the Regent's Canal; the details of their construction in plan, elevation, and section, are also given in Plate 5, accurately reduced from the original working drawings.

The Euston Square station is that intended for passengers, and the Camden station for heavy goods and merchandise, for which it is particularly adapted, being at the side of the Regent's Canal, by which means a water communication may be obtained for the merchandise and produce of the manufacturers of the midland counties, with the shipping in the port of London, and hence with the whole world.

The Roof of the Passengers' Arrival and Departure Shed, at Euston Grove (as represented in Plate 7), has a very light and elegant appearance; it is constructed principally of wrought-iron, the brestsummers, columns, and gutters only being of cast-iron. The entire width is eighty feet, formed in two spans of forty feet each, a row of iron columns and brestsummers supporting the rafters in the centre and outside, as shown by the engraving, and on the opposite side by iron corbels built in the wall, and further secured thereto by strong bolts and nuts; the rafters are six feet eight inches apart, and are of wrought iron, in form of the letter T; the slate battons, as they may be called, are of angle iron, firmly rivetted to the back of the rafters at such a distance as the slates require, and to which they are secured by strips of copper. The roof is firmly tied from side to side by a tension rod of one inch and a quarter diameter to each pair of rafters, and is further supported and braced by strutts of T iron and suspension rods, with nuts and screws to adjust their length, as shown in engraving. The entire length of the roof is two hundred feet; the gutters are cast in lengths of ten feet each, joined together by flanges and bolts, and so fixed as to form an incline towards each column, which being cast hollow and having a pipe connected with a drain, they form a convenient and easy conveyance for rain from the roof. (Plate 7.)

The Roof of the Locomotive Engine House, at Camden Town, is of very similar construction to the one above described; the rafters are of T iron, and the slates are supported by angle iron rivetted to the rafters. There are cast-iron chairs secured down to a stone coping on the walls, and from which the rafters spring; each pair of rafters is tied by means of a tension rod, and otherwise supported and braced by strutts of T iron, and suspension rods of round iron, which make the whole very firm, and gives it a light and pleasing appearance.

The only part we do not like in the roofs, is placing the tie-bolts diagonally, instead of horizontally, and if the flange of the struts had been in the centre instead of the top, they would have been much stronger. The plates which follow, exhibit the details of several bridges on the extension line between Camden Town and Euston-square; they are beautifully drawn in detail. The Stanhope-place bridge of two arches appears to be rather of a hazardous construction, particularly if the thoroughfare over the bridge be considerable; the details of the Park-street bridge, constructed of iron ribs, is instructive and deserving of study; so is the bridge over the Regent's Canal, the architectural effect of the stone piers is in good keeping with the structure. The next plates exhibit the viaduct of five arches over the river Colne, near Watford, and the bridge of three arches over the excavation south of Watford tunnel; the drawing of the skew, or oblique bridge, at Box-moor, clearly shows the construction of the brick and stone-work; the angle of the skew is thirty-two degrees, the span of the arch on the face is thirty-nine feet six inches, and across, at right angles, with the springing walls, twenty-one feet; rise of the arch five feet eight inches. The plate containing the section of the Primrose-hill tunnel and the Northchurch tunnel, exhibits the relative proportions of strength for the different strata through which they pass: the former tunnel passes through London clay, it is twenty-four feet wide and twenty-five feet high in the clear, the arch is three bricks thick, with an invert two bricks thick; the other tunnel passes through chalk, it is twenty-four feet wide in the clear, and twenty-three feet three inches high above the rails; the arch is two bricks thick, without an invert; it will thus be perceived, that the tunnel through chalk is one brick thinner than the other, besides the omission of the invert. The ten plates representing the working sections of the Blisworth excavations and embankments, for a distance of five miles, is of great utility to the student, and of considerable importance, as it shows him the necessary preliminary surveys and sections explaining the surface of the ground, and the nature of the strata of the ground-work through which the excavations are intended to be cut, which are necessary for the guidance and assistance of the contractors in making their estimates. The four following plates of the undersetting of the rock in the Blisworth cutting are admirably drawn and beautifully engraved in mezzotinto; they are copies of the original drawings. The design for the entrance of the Kilsby tunnel is in the Moorish style, and which, together with the details of the tunnel, are exhibited in ten plates.

The next plates show the different rails and chairs that have been adopted on the line: the first is the fish-bellied rail, weighing 50 lbs. per yard, with a complicated chair, which, we believe, is now abandoned; the next, is the rail generally adopted on the line for four feet bearings, weighing 65 lbs. per yard, of malleable iron *a*, which is secured by a key or wedge of compressed wood *c*, to a chair of cast-iron *b*, fixed to the stone sleepers *f*, by two iron pins or spikes *d*, driven into oak-plugs *e*, let into the stone; the sleepers are of granite, or Bramley-fall stone, two feet square and one foot thick. The annexed figures, one and two, show the con-

Fig. 1.

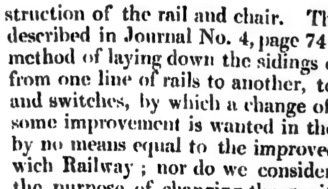
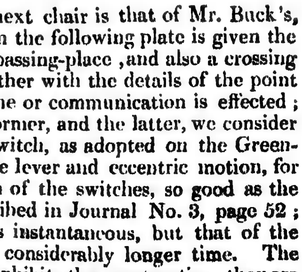


Fig. 2.



struction of the rail and chair. The next chair is that of Mr. Buck's, described in Journal No. 4, page 74; in the following plate is given the method of laying down the sidings or passing-place, and also a crossing from one line of rails to another, together with the details of the point and switches, by which a change of line or communication is effected; some improvement is wanted in the former, and the latter, we consider by no means equal to the improved switch, as adopted on the Greenwich Railway; nor do we consider the lever and eccentric motion, for the purpose of changing the position of the switches, so good as the lever with a balance-weight, as described in Journal No. 3, page 52; the change of motion by the latter is instantaneous, but that of the lever and eccentric motion occupies a considerably longer time. The drawing of the twelve feet turn-rails exhibits the construction, they are of cast-iron. The next plate contains a drawing of a first-class carriage; each carriage consists of three bodies or compartments, the extreme length, outside measure, being fifteen feet six inches; the length of each body, four feet eleven inches; the breadth, six feet; and the height, from floor to roof, four feet six and a half inches, all inside measure, and exclusive of the stuffing. The body is placed above the wheels, four feet from the ground, which we do not consider so good or so safe as the carriage with the body hung within a few inches of the ground.

* *Inclination of Extension.*

Chains.			
13¼	Level.		
16¼	Rise 1 in	66	Hampstead Road to Crescent Place.
17	Rise 1 in	110	Crescent Place to Park Street.
9		132	Park Street Bridge.
15		75	Park Street to Regent's Canal.

Great Western Railway. I. K. BRUNEL, Esq., Engineer. Plates 54 to 58.

The first three plates represent the plan, elevation, and section of the Wharncliffe Viaduct, over the river Brent, near Hanwell, one of the principal works on the line.

The execution of the Wharncliffe viaduct formed the contract No. 1, London division; the first contract let along the line, and about the first completed. This contract was obtained by Messrs. Grissel and Peto.

The arches are elliptical. The piers consist each of two massive square pillars, rising from a single plinth, and surmounted by simple capitals of stone of a somewhat Egyptian character. The wing walls are straight, and the space between them, which is hollow, is covered by a transverse arch, springing from wall to wall, the walls being inclined in the direction of the thrust resulting from the arch. The particulars of the work are as follows:—

		Feet.	Inches.
Total length, including wing walls		900	0
Eight main arches	Span of each	70	0
	Rise	17	6
Breadth between the parapets		30	0

The foundations of the piers were carried through the loose gravel about three feet into the strong blue clay, and the foot of each pier stands on an area of two hundred and fifty two square feet.

Upon striking the centering the arches followed from 1 inch and ¾ to 2 inches and ¼, the latter being the greatest fall, and the average being below 2 inches. The spaces between the arches were crossed by spandrell walls, and a floor of York landings laid upon the whole; the parapet and coping were added at a later period. The work was commenced in February, 1836, and was completed at the latter part of the summer of the following year.

The Brent is carried through a brick channel, beneath the second arch.

The viaduct is met at each end by an embankment; that on the east is formed from the excavation for the Railway towards Acton, consisting principally of gravel, and that on the west is formed entirely of a very hard binding gravel, obtained from side cuttings at the top of the hill.

We have our fears for the safety of the two arches at each end of the viaduct, unless strong cross-ties of iron have been introduced, which are not shown in the drawing, as we consider that the heavy locomotive rolling over the arch will have a powerful effect, and the thrust become so great, that it will have a tendency to force out the springing walls, notwithstanding their great inclination or batter.

The next two plates represent the Maidenhead Bridge.

Maidenhead Bridge.—This bold and magnificent undertaking is represented in plates 57 and 58. It consists of two arches, each of one hundred and twenty-eight feet span, with an intermediate pier of thirty feet in width. The materials of which this structure is composed is almost entirely of brick, with a very small portion of stone. These arches will be the first of such a magnitude turned wholly in brick. The result, which will now very soon appear, will, doubtless, confirm the high reputation for science and enterprise enjoyed by the eminent Engineer who designed, and is now executing, the work.

London and Southampton Railway. Plates 59 to 64.

Exhibit several common-place bridges, possessing neither novelty nor skill in the construction.

London and Greenwich Railway. Colonel LANDMANN, Engineer. Plates 65 to 70.

The four first plates represent the oblique arches over the Neikinger and Spa Roads. They are decidedly the best designed works on the line, and are a relief to the monotonous line of bricklayers' arches. These two bridges are constructed with one principal arch and two footway arches. The road is divided from the footpath by four Grecian-fluted Doric columns of cast-iron, and two piers of stone, which together have an air of lightness combined with the appearance of strength. The other two plates show the construction of the viaduct and the railway.

London and Croydon Railway. JOSEPH GIBBS, Esq., Engineer. Plates 71 and 72.

The first plate represents the bridge at New Cross. The Dover road is carried over the railway by a flat segmental arch, 30 feet span, the rise or versed line is only two feet. The width of the road is 64 feet, and is supported by 19 cast-iron curved girders or ribs; the parapet walls are supported by arches of brick set in cement. We very much approve of the plan of introducing iron plates between the lower parts of the ribs, which form a soffit in panels, and relieve the vacant and heavy appearance that otherwise would have been, had the space between been left open. The clear height under the bridge, above the surface of the rails, is 14 feet. The construction of this bridge forms a good precedent for railways which are obliged to pass under turnpike-roads, and where the height is confined, as is generally the case. The next plate represents the construction of the railway, which we shall notice hereafter, in consequence of the legal proceedings in Chancery, instituted against the Company by Mr. Parkin, for a *supposed* infringement of his patent.

Birmingham, Bristol, and Thames Junction Railway. W. HOSKING, Esq., Engineer. Plates 73 and 74.

The two plates show a happy combination of circumstances for exhibiting the skill and ingenuity of the engineer. At Wormwood Scrubbs, the railway will intersect the Paddington Canal, and a road; the railway will pass under the canal by means of a gallery 110 feet long, with lofty approaches, the clear headway being 14 feet 3 inches above the rails, with a clear breadth of 24 feet; a corridor or footway is formed on the side of the gallery to connect the two stations of the Company. The arch over the gallery is elliptical; the haunches are formed in brickwork, with a string-course or springer of stone for the abutments of cast-iron ribs which are to carry the crown of the arch, and filled in between with brickwork of *Rhodes's patent compressed bricks*, set in pouzzolana mortar: over the gallery is the aqueduct, formed in brickwork for the canal, which is to be diverted; over the canal and the tunnel is an iron bridge, suspended to two pair of segmental cast-iron ribs; in the centre is a carriageway 20 feet wide; and on the sides, between each pair of ribs, are the footways 5 feet wide; the span of the bridge is 70 feet. The appearance is extremely light, and we fear is really so, particularly if there should be hereafter much traffic over the bridge: the whole of the design exhibits considerable skill and judgment; the erection of the work is undertaken by Messrs. W. and L. Cubitt, for the sum of £7,680.

Glasgow and Gairnkirk Railway.—Plate 75 represents the cutting through the moss or peat which abounds on this line of railway.

Plate 76 is a comparison of rails drawn to one scale, excepting one, the Great Western rail, which appears to have been drawn by mistake at full size, as all the other rails are drawn at half the full size.

Locomotive Engines. Plates 76 to 78.

These plates are very beautifully engraved. One represents '*The Comet*' locomotive engine; the other "*Stephenson's patent locomotive engine, with six wheels,*" and her tender. We extract the following particulars from the work:—

It was many years after the first attempt to apply steam to the purposes of locomotion before it was satisfactorily ascertained that the adhesion of the wheels of an engine upon the rails was sufficient to effect its progression; and many contrivances of various degrees of ingenuity were brought forward to produce locomotion without the aid of adhesion at all. It was in 1813 that Mr. Blackett, of Wylam, had an engine constructed which worked by the adhesion of its wheels on the rails only. "His railroad was a plate rail, and would, consequently, present more friction or resistance to the wheels than an edge rail; and, on that account, the amount of adhesion would be greater than upon the latter rail. Still the credit is due to Mr. Blackett, for proving that the locomotion could be applied by that means alone." Since which time the contrivances for facilitating locomotion have been numerous and highly successful; and, in the hands of George Stephenson, Esq., followed by other scientific persons, the locomotive engine has become a wonderful machine, and promises, by its almost magical effects, to take a large share in improving the social, moral, and political condition of kingdoms. Two of the most modern construction are represented in Plates 77 and 78, of which the following are the particulars:—

Comet Locomotive Engine.—Plate 77 represents the 'Comet' locomotive, made by R. and W. Hawthorn, civil engineers, manufacturers of steam engines and machinery generally, of Newcastle-upon-Tyne, for the Newcastle and Carlisle Railway, being the first engine put upon this line. The cylinders are placed in a horizontal position, twelve inches diameter, and sixteen inch stroke. Wheels, four in number, four feet diameter, coupled by side bars. The crank pins are fixed in the wheels, having no outside frame. Boiler seven feet five inches long, three feet diameter, with sixty six brass tubes, seven feet nine inches and a half long, two inches exterior diameter. Fire box forty one inches wide, twenty-one inches and a half long, and thirty 3 eight inches above the grate, having thirty-seven feet and a half of radiating heat, and two hundred and sixty-nine feet of communication heat. The slides are worked by four fast eccentrics, first introduced into this engine by the manufacturers, instead of two loose ones heretofore used, and the complicated machinery for reversing the motion hereby materially simplified, and rendered much more secure, both as regards regularity of motion, and its being less liable to derangement, which, with further improvements upon this principle, have been invariably used by these gentlemen in their manufacture of other engines.

The 'Harvey Combe Engine,' Mr. Stephenson's Patent. Plate 78.

Cylinders	Diameter	12 inches.
	Length of Stroke	18 „
Tubes, 120 in Number.—Internal diameter		1¾ „
Wheels. . .	One Pair (driving wheels)	5 feet diameter.
	Two Pair	3 feet 6 inches.
Weight. . .	When empty, nearly	10 tons.
	Of water, fuel, &c.	1 ton 18 cwt.

Total evaporating surface about 480 feet superficial—estimated to be about 50-horse power.

We shall continue our notice in the next Journal.

On Warming and Ventilating, with Directions for making and using the Thermometer Stove, or Self-Regulating Fire, and other new Apparatus. By Neil Arnott, M.D. London: Longman and Co. 1838.

The system of warming and ventilating of buildings is becoming a matter of consideration by all classes. The old system of warming by open fire-places appears to be doomed to annihilation. Count Rumford was the first who called the attention of the public to the wasteful expenditure of fuel in the old-fashioned fire-places of his day, when it was considered a luxury to have a chimney large enough to allow a chair being placed on each side of the grate. By his numerous experiments and public illustrations, he led the way to reducing the opening to at least a third of the original size. He pointed out that the nuisance of smoky chimneys was principally owing to the large opening made for the fire-place, and the improper setting of the stove. He recommended the aperture to be both reduced in height and width, the angles contracted by bevelled or splayed covings set at an angle of 45°, the orifice of the flue to be made much smaller, the width not to exceed four or five inches, and the length not more than the width of the fire-place; and from these directions of Count Rumford were manufactured the "Rumford improved register stove." From this time, instead of the chimney breasts projecting into the room, in many cases a fourth of the width, they did not project more than about a foot. According to Dr. Arnott's experiment, it appears that even this contracted fire-place is much too large, and that there is no necessity for building chimney flues larger than one-fourth of the present size, and that the recess left in the chimney for the stove may be altogether abandoned. From the description given by the Doctor of his stove, and the great saving it will effect in fuel, we cannot but think that it will cause a complete revolution in the science of warming and ventilating of buildings. What can be a greater boon to the public than this invention? The poor of the metropolis, during the present winter, have suffered most severely from the cold, in consequence of the enormous price of fuel, owing partly to the monopoly of the coal-owners, and also to the severe frost which had blocked up the river Thames. According to Dr. Arnott's statement, the hovel of the poor may have a delightful degree of warmth kept up the whole of the day for the trifling sum of *one penny!* And whether the inhabitant be at home or abroad, the fuel may be kept ignited, so that after the toil of the day the poor artisan may return to his room already warmed for his reception. We have been led to these remarks on account of the numerous cases of privations which we have heard of during the present inclement season, and we think that it would be one of the greatest blessings to the poor if a society were established for the manufacture of these stoves upon an economical scale, and selling them to the needy at the prime cost, to be repaid by weekly instalments, and, in cases of known destitution, presenting or lending the same for the season; we feel convinced, that such a society would do more good than many of the numerous and excellent societies with which this country abounds. The stove, if manufactured on an extensive scale, and made plain and economically, would not cost more than a few shillings, the only part which requires any nicety of workmanship is the self-regulating valve.

We will now proceed to give a sketch of the great mass of information condensed in this treatise. The introduction points out the principal causes of disease in the human frame, and the necessity of a proper degree of warmth and ventilation, which are as requisite to the human race as food.

The object of this essay is to render the knowledge on the subjects of ventilation and warming which now exists among the learned, familiar to all, and to introduce to public notice new and simple means of securing the ends in view.

The following extract will be found useful:—

On Warming.—All animal bodies require to exist in a certain temperature, which in those called warm-blooded, is considerably higher than of the surrounding atmosphere; and by the actions of life they maintain in themselves that which to each is suitable. This continues very nearly uniform, notwithstanding considerable fluctuations in the temperature of the air, and of other objects around them. In man the animal heat is of 98 of Fahrenheit, whether under the burning sun of India, or amidst the snows of the Pole. The animal heat is maintained above lower surrounding temperatures chiefly by the function of respiration, in which the oxygen of the air received into the lungs, combines by a kind of slow combustion with carbon from the blood, and gives out heat, nearly as when oxygen and carbon combine in a common fire. This focus of heat suffices to maintain the healthy temperature even in a naked body, in air at from 60° to 70°, and in bodies clothed with fur or feathers, it will maintain that temperature in air which is very cold indeed.

* * It would be a good rule for persons in Europe to clothe themselves in winter so as to be comfortable in a room at a temperature of 60° or 62°, and to let that be the steady temperature of their common apartments, which it could then never be dangerous either to enter or to leave. Now, with common fires in England, rooms are often heated up to 70° or above, and cooled down to 50° or below.

Ordinary combustion is chemical union taking place with intense energy, productive of light and heat, between oxygen and some substance to which oxygen has strong chemical attraction. The substances which so combine with oxygen are called combustible, and of these the most common and cheapest are coal, wood, coke, charcoal, and peat. Of the heat produced in the combustion of coals, a proportion [rather less than half is radiated around the fire, as the light is from a fire or from a candle, and rather more than half combines with the air which feeds the combustion and rises with the smoke, to be dissipated in the atmosphere. Experiment has shown that

One pound of good coal	. . . . .	Melts of ice	.. 90 lbs.
— Coke	. . . . .	—	.. 84
— Wood	. . . . .	—	.. 32
— Charcoal of wood	. . .	—	.. 95
— Peat	. . . . . .	—	.. 19

indicating the comparative values of these substances as fuel,—and the exact relation is known between the quantity of heat required to melt ice, and to effect other results. The quantity of heat which raises the temperature of a cubic foot of water one degree, being called one, of such ones or units, 140 will melt a cubic foot of ice; 180 will raise the temperature of a cubic foot of water from 32°, or freezing, to 212°, or boiling temperature; 960 more will convert that into steam; and what heats a cubic foot of water 1°, will heat 2,850 cubic feet of common air also 1°, or half that quantity 2°, and so forth. One mode of estimating how much of the heat of a fire radiates around it, and how much combines with the smoke, is to let all the radiant heat melt ice in a vessel surrounding the fire, and all the heat of the smoke melt ice in another vessel surrounding the chimney. The two quantities of water thus obtained, and measuring the quantities of ice melted, prove the radiant portion of the heat to be in ordinary cases rather less than the combined, that is to say, to be less than half of the whole heat produced.

The treatise next explains the several modes of obtaining heat which have been adopted, and are as follows:—*A fire in the open air*, as still adopted by houseless savages; a *fire under cover*, by burning of wood or charcoal in the centre of the room. This barbarous mode was in use in some of our London Inns of Court within the last few years, and is still adopted in some of the large halls of the Colleges at the English Universities; and *the open fire under a chimney*.

This is the plan now generally used in England, and we shall therefore take the common open English fire as a familiar standard with which to compare other plans; and we shall moreover consider all the plans in reference to the great object sought by them, of obtaining everywhere on earth, at will, the temperature most congenial to the human constitution, such as exists in an English summer evening, and in air as pure as blows on any hill-top.

By an *open English fire* it is impossible to obtain in a room any temperature. The heat used is that portion only which radiates around with the light, while all that is in the smoke passes up the chimney. This radiated heat first warms the walls and other objects on which it falls, and these by contact with the air of the room then warm it. There are however serious disadvantages, which we shall now enumerate.

1. *Waste of fuel.*—We find that of the whole heat produced from the fuel used, about seven-eighths ascend the chimney, and are absolutely wasted. The loss of heat is, first, the more than half which is in the smoke as it issues from the burning mass. Secondly, that carried off by the current of the warmed air of the room, which is constantly entering the chimney between the fire and the mantelpiece, and mixing with the smoke. This is estimated at nearly two eighths. Thirdly, it is a fact that the black or visible part of the smoke of a common fire is really a precious part of the coal or wood escaping unburned. If then more than half of the heat produced be in the smoke, and nearly a fourth of it in the warm air from the room which escapes with the smoke, and if about an eighth of the combustible pass away unburned, there is a loss of at least seven-eighths of the whole. Count Rumford estimated the loss at still more; namely, fourteen-fifteenths.

Dr. Arnott then proceeds to point out other evils attending open fire-places, and which he considers are the causes of unequal heating at different distances from the fire—cold draughts, cold foot-bath, bad ventilation, smoke and dust, loss of time, danger to property, danger to person, expense of attendance, and, lastly, the necessity of having sweeping-boys. He then gives an account of the different systems of warming, and the evils attending each; first, the *common close stove*, commonly known as the Dutch stove.

There is, however, one disadvantage peculiar to the close stove, which countervails nearly all its good qualities, namely, that its very heated surface of iron acts upon the air which comes in contact with it, so as to impair exceedingly the air's purity and fitness for respiration. The air acquires a burnt and often sulphurous smell, in part, no doubt, because dust, which it often carries, is burned, and in part because there is a peculiar action of the iron upon the air. It becomes very dry, too, like that of an African simoom, shrivelling every thing which it touches; and it acquires probably some new electrical properties. These changes combined make it so offensive, that Englishmen unaccustomed to it cannot bear it. In this country many forms have been proposed, some of them gracefully designed, with transparent talc doors and other attractions; and they have been tried in rooms, public offices, passages, halls, &c., but have been afterwards very generally abandoned. Persons breathing the air heated by them are often affected by headaches, giddiness, stupor, loss of appetite, ophthalmia, &c. A north-east wind, which distresses many

people, bringing asthmas, croups, &c., and which withers vegetation, is peculiar chiefly in being dry.

In northern continental Europe, to avoid deteriorating the air by the overheating of the surface of an iron stove, it is now common to make close stoves and their chimneys of thick brickwork, either included in the walls, or projecting as a bulky mass into the rooms, the rooms being often covered with porcelain. These do not allow the heat of the fire to pass outwards so quickly as a metal stove, and hence their exterior does not become so much heated. The heated stove continues to warm the room long after the fire is extinguished, but of course with diminishing power. These stoves, as compared with an open fire, are very economical. An English gentleman once at St. Petersburgh, wishing to see there his old English fire, had an open chimney constructed, but found that with all it could do, and although the close stove also was plied as much as possible, and was lighted twice in the day instead of once, the room was much colder than before.

An economical mode, known in China, of using fuel to warm rooms, is to have the floors of tile, below which the hot smoke of a close fire passes.

In England, where such activity of thought prevails on all subjects interesting to humanity, and where, from the advancement of the arts generally, wants in relation to temperature arose which scarcely existed elsewhere—as in the necessity of heating factory rooms so large, that one fire was insufficient, and more than one were inadmissible—the imperfection of the open fire, and of the close stoves, having been strongly felt, other means were eagerly sought, and are now extensively used; namely, 1. Steam admitted to pipes or other vessels placed in the apartments to be warmed; 2. Hot water similarly admitted and distributed and circulating back to the boiler to be heated again; and 3, Heated air prepared in a separate place, and then distributed by various means over the building to be warmed.

The following calculations will be found useful for ascertaining the proper proportions of heating surface.

To determine the extent of surface of steam-pipe or vessel necessary to warm particular apartments, it was to be considered that the loss of heat from them occurs in three ways—1st, rapidly through the thin glass of the windows; 2dly, more slowly through the thick substance of the walls, floor, and ceiling; and, 3dly, in combination with the air which escapes at the joinings of the windows and doors, or at other openings purposely made for ventilation. Different writers and manufacturers have made very different estimates of the quantities of heat lost in these various ways, and as yet no exposition of the matters has been made with the accuracy which the subject deserves; but an intermediate estimate, as applied to common cases, may be shortly stated thus:—that in a winter day, with the external temperature at 10° below freezing, to maintain in an ordinary apartment the agreeable and healthful temperature of 60°, there must be of surface of steam-pipe, or other steam-vessel, heated to 200° (which is the average surface temperature of vessels filled with steam of 212°), about one foot square for every six feet of single glass window, of usual thickness; as much for every 120 feet of wall, roof and ceiling, of ordinary material and thickness; and as much for every six cubic feet of hot air escaping per minute as ventilation, and replaced by clod air. A window, with the usual accuracy of fitting, is held to allow about eighty feet of air to pass by it in a minute, and there should be for ventilation at least three feet of air a minute for each person in the room. According to this view, the quantity of steam-pipe or vessel needed, under the temperatures supposed, for a room sixteen feet square by twelve feet high, with two windows, each seven feet by three, and with ventilation by them or otherwise at the rate of sixteen cubic feet per minute, would be—

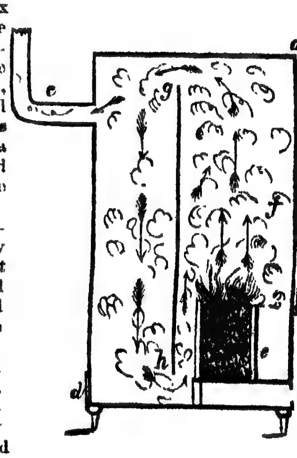
For	42 Square feet of glass (requiring 1 foot for 6)	7
	1,238 Feet of wall, floor, and ceiling (requiring 1 foot for 120)....	10⅓
	16 Feet per minute, ventilation (requiring 1 foot for 6)........	2⅔
	Total of heating surface required	20

which is twenty feet of pipe four inches in diameter, or any other vessel having the same extent of surface, as a box two feet high, with square top and bottom of about eighteen inches. It may be noticed that nearly the same quantity of heated surface would suffice for a larger room, provided the quantity of window-glass and of the ventilation were not greater; for the extent of wall, owing to its slow conducting quality, produces comparatively little effect.

A heated surface, as of iron, glass, &c., at temperatures likely to be met with in rooms, if exposed to colder air, gives out heat with rapidity nearly proportioned to the excess of its temperature above that of the air around it, less than half the heat being given out by radiation, and more than half by the contact of the air. Thus one foot of iron pipe of 200° external temperature in the air of a room at 60°, the difference between them or excess being therefore 140°, gives out nearly seven times as much heat in a minute as when its temperature falls to 80°, reducing the excess to 20°, or a seventh of what it was. If window-glass, therefore, cooled at the same rate as iron plate, one foot of the steam-pipe iron would give out as much heat as would be dissipated from the room into the external air by about five feet of window, the outer surface of which were 30° warmer than that air. But, because glass both conducts and radiates heat in any case about one-seventh slower than iron, the external surface of glass of ordinary thickness, forming the window of a room heated to 60°, would, in an atmosphere of 22°, be under 50°, leaving therefore an excess of less than 30°; and about six eet of glass would be required to dissipate the heat given out by one foot of he iron steam-pipe. Through double windows, whether consisting of two sashes, or of double panes half an inch apart in the same sash, the loss of heat is only about a fourth part of what takes place through a single window. Then, it is a fact ascertained by experiment, that one foot of black or brown iron surface, the iron being of moderate thickness, with 140° excess of temperature, cools in one second of time 156 cubic inches of water, one degree of Fahrenheit's thermometer. From this standard fact, and the law given above, a rough calculation may be made for any other combination of time, surface, excess, and quantity. And it is to be recollected that the quantity of heat which changes in any degree the temperature of a cubic foot of water, produces the same change on 2,850 cubic feet of atmospheric air.

We now come to the most important part of the treatise, which describes the *self-regulating fire*, or *thermometer-stove*. The Doctor first enumerates the difficulties he had to contend with in obtaining a stove to meet all the requisites of properly warming his library, which ultimately led to the construction of a stove, which he thus describes :—

The object sought was now clearly seen to be, merely to place in any apartment the required extent of metallic surface, kept steadily at a temperature not exceeding 200° of Fahrenheit. It evidently was of no importance what hot fluid filled or warmed the vessel—whether water, steam, oil, or air, or whether there were an included fire—provided the temperature of the surface was maintained; for the box in any case would be quite close, permitting no escape of its contents. If, therefore, in a box of the required size, a fire could be placed so as to warm the box with perfect uniformity all around, while the fire itself were so controlled by a self-acting regulator, that it should burn always exactly as fast as was required to keep the box steadily at any desired temperature, the object sought would be attained, and there would be many concomitant advantages of cheapness, simplicity, &c. These words have sketched the *Self-regulating Fire, or Thermometer Stove*, of which the form first tried is now to be described more particularly by aid of the woodcut.



The outline *a b d c* represents a box formed of sheet-iron, and divided by the partition *g h* into two chambers, communicating freely at the top and bottom. The letter *e* marks the fire-box or furnace, formed of iron, lined with fire-brick, and resting on a close ash-pit, of which *b* marks the door, and near which door there is a valved opening, by which air enters to feed the fire when the door is shut; *i* marks the door of the stove by which fuel is introduced, *c* is the chimney-flue. While the stove-door and ash-pit door are open, a fire may be lighted, and will burn in the fire-box just as in a common grate, and the smoke will rise and pass away by the chimney, mixed with much colder air rushing in by the stove-door; but if the stove-door and ash-pit door be then closed, and only as much air is admitted by the valved opening in the ash-pit as will just feed the combustion, only a small corresponding quantity of air can pass away by the chimney, and the whole box will soon be full of the hot air or smoke from the fire circulating in it, and rendering it every where of as uniform temperature as if it were full of hot water. This circulation takes place, because the air in the front chamber around the fire-box, and which receives as a mixture the red-hot air issuing from the fire, is hotter, and therefore specifically lighter than the air in the posterior chamber, which receives no direct heat, but is always losing heat from its sides and back; and thus, as long as the fire is burning, there must be circulation. The whole mass of air is, in fact, seen to revolve, as marked by the arrows, with great rapidity; so that a person looking towards the bottom of the stove through the stove-door *i*, might suppose, if smoking uel had been used to make the motion visible, that he was looking in at the top of a great chimney. The quantity of new air rising from within the fuel, and the like quantity escaping by the flue *c*, are very small compared with the revolving mass. There remains to be noticed only the thermometer regulator of the combustion. Many forms presented themselves to my mind, as described in the section on the manufacture of the stove, any one of which will close the air-passage, slackening or suspending the combustion at any desired degree, and will open it again instantly, when the temperature falls below that degree.

I had thus a simple box of iron, of cheap and easy construction, answering all the purposes of expensive steam or hot-water apparatus, burning its fuel as steadily and as regularly as an argand lamp burns its oil, or as an hour-glass lets its sand run through, and allowing me, by merely touching a screw on the thermometer, rapidly to increase or diminish its heat, as by touching another regulating screw we increase or diminish the light of a lamp.

What chiefly surprises a stranger in this new stove, is the very small quantity of air required to support the combustion which warms a large room; the whole might enter by an opening of half an inch diameter, and the quantity of air or smoke which passes into the chimney is of course proportionally small. These facts at once suggest how small the consumption of fuel must be, as that depends on the quantity of air entering, how perfect the combustion of the fuel must be where so little is expended, and how completely the heat produced in the combustion must be turned to account. The combustion is so perfect, because the fuel is surrounded by thick fire-brick, which confines the heat so as to maintain intese ignition; and the

saving of heat is proved by the rapidly diminishing temperature of the flue, detected by a hand passing along it from the stove. During the winter 1836-7, which was very long and severe, my library was warmed by the thermometer-stove alone. The fire was never extinguished, except for experiment or to allow the removal of pieces of stone which had been in the coal, and this might have been prevented by making the grate with a moveable or shifting bar. The temperature was uniformly from 60° to 63°. I might have made it as much lower or higher as I liked. The quantity of coal used (Welch stone-coal) was for several of the colder months, six pounds a day—less than a pennyworth—or at the rate of half a ton in the six winter months. This was a smaller expense than of the wood needed to light an ordinary fire, therefore the saving was equal to the whole amount of the coal merchant's ordinary bill. The grate, or fire-box, fully charged, held a supply for twenty-six hours.

The thermometer-stove, as compared with other modes of warming, will be best understood, by reviewing its chief qualities. A general expression for them is, that it possesses all the advantages of steam or hot water warming, with many advantages peculiar to itself.

1. *Economy of fuel.*—We have seen, at Art. 18, that a common open fire wastes seven-eighths of the heat produced. This stove saves or puts to use very nearly the whole, because, first, it does not allow the air which has fed the combustion to escape, until deprived of nearly all the heat; and, secondly, it does not allow any of the warm air of the room, except the little which feeds the fire, to escape through the chimney. Marking, strikingly, how the heat produced in the stove is applied to use, we find that a sheet of paper set fire to, and put into a cold stove, will warm the whole almost as if boiling water had been poured into it, and the heat is afterwards all diffused in the room. The same sheet of paper burned under the chimney of an ordinary grate, would produce no sensible effect in the room. The ascertained fact respecting the expenditure of the stove is, that an eighth of the fuel which is needed for a common fire suffices; and stone-coal, or anthracite, coke, and even cinders—in a word, the cheapest fuel—answers better than that which is dearer. Thus, since bituminous coal has become so precious, as the gas-giving material for common lights—the remnant of it, after the gas is taken away, has also acquired a new value.

The Author then proceeds to explain the other advantages of his stove—uniform temperature in all parts of the room and throughout the day, the stove is always alight, no smoke, no dust, no danger to persons or property, obedience to command, trifling original expense, small expense of attendance upon it, it is easily moved, may be made of a graceful form, it is a good cooking-stove, no sweeping-boys are required,

The advantages hitherto enumerated of the stove in its domestic bearing, might be otherwise classified under the heads of economy of fuel—economy of original expense—economy of service economy of comfort—economy of health and of life—economy of furniture and property generally—and economy of time.

The principles embodied in Dr. Arnott's stove are evidently described by Count Rumford, in his "Essays on the Management of Fire and the Economy of Fuel, as follows :"—

"Though it is not known exactly how much heat it is possible to produce in the combustion of any given quantity of any given kind of fuel, yet it is more than probable that the quantity depends in a great measure on the management of a fire. It is likewise probable, I might say certain, that the heat produced is furnished, not merely by the fuel, but in a great measure, if not entirely, by the air by which the fire is fed and supported. It is well known that air is necessary to combustion; it is likewise known that the pure part of common atmospheric air, or that part of it (amounting to about one-fifth of its whole volume) which alone is capable of supporting the combustion of inflammable bodies, undergoes a remarkable change, or is actually decomposed in that process; and as in this decomposition of pure air, a great quantity of heat is known to be set loose, or to become redundant, it has been supposed by many (and with much appearance of probability), that by far the greater part, if not all the heat produced in the combustion of inflammable bodies, is derived from this source.

"But whether it be the air, or the fuel, which furnishes the heat, it seems to be quite certain that the quantity furnished depends much upon the management of the fire, and that the quantity is greater as the combustion or decomposition of the fuel is more complete. In all probability, the decomposition of the air keeps pace with the decomposition of the fuel.

"It is well known that the consumption of fuel is much accelerated, and the intensity of the heat augmented, by causing the air by which the combustion is excited to flow into the fire-place in a continued stream, and with a certain degree of velocity. Hence, blowing a fire, when the current of air is properly directed, and when it is not too strong, serves to accelerate the combustion, and to increase the heat; but when the blast is improperly directed, it will rather serve to derange and to impede the combustion than to forward it; and when it is too strong it will blow the fire quite out, or totally extinguish it.

"Fire-places may be so constructed that the fire may be made to blow itself, or—which is the same thing—to cause a current of air to flow into the fire; and this is an object to which the greatest attention ought to be paid in the construction of all fire-places where it is not intended to make use of an artificial blast from bellows for blowing the fire. Furnaces constructed upon this principle have been called air-furnaces; but every fire-place, and particularly every closed fire-place, ought to be an air-furnace, and that even were it intended to serve only for the smallest saucepan, otherwise it cannot be perfect. * * *

"By surrounding the fire on all sides by a wall, the cold atmosphere is prevented from rushing in laterally from all quarters to supply the place of the heated air or vapour, which, in consequence of its increased elasticity from the heat, continually rises from the fire, and this causes the current of the air below (the only quarter from which it can with advantage flow into the fire) to be very strong.

"But in order that a fire-place may be perfect, it should be so contrived that the combustion of the fuel, and the generation of the heat, may occasionally be accelerated or retarded, without adding to or diminishing the quantity of fuel; and, when the fire-place is closed, this may easily be done by means of a register in the door, which closes the passage leading to the ash-pit;—for, as the rapidity of the combustion depends upon the quantity of air by which the fire is fed, by opening the register more or less, more or less air will be admitted into the fire-place, and consequently more or less fuel will be consumed, and more or less heat generated in any given time, though the quantity of fuel in the fire-place be actually much greater than what otherwise would be sufficient.

"In order that this register may produce its proper effect, a valve, or a damper, as it is commonly called, should be placed in the chimney or canal by which the smoke is carried off; which damper should be opened more or less, as the quantity of air is greater or less which is admitted into the fire-place. This register and this damper will be found very useful in another respect—and that is, in putting out the fire when there is no longer an occasion for it; for, upon closing them both entirely, the fire will be immediately extinguished, and the half-consumed fuel, instead of being suffered to burn out to no purpose, will be saved.

"Nearly the same effects as are produced by a damper may be produced without one, by causing the smoke, after it has quitted the fire-place, to descend several feet below the level of the grate on which the fuel is burned, before it is permitted to go up the chimney.

Dr. Arnott next proceeds to make some judicious remarks on ventilation, which we must defer noticing for another opportunity: he then points out the advantages of his stove for the purpose of *warming and ventilating an ordinary sitting-room.*

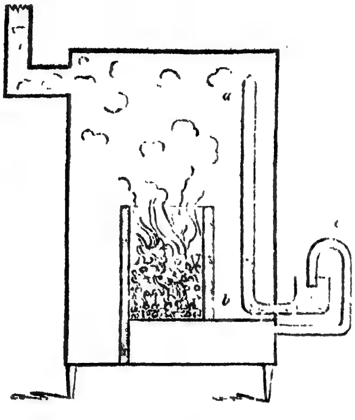
Warming and ventilating an ordinary sitting room.—An ordinary sitting-room, or any apartment of moderate size, occupied by a family of a few persons, will be easily warmed by one thermometer-stove, of dimensions calculated by the rule given at Art. 37. The stove gives out its heat partly by radiation all around it, but chiefly by warming the air which touches it. This air then ascends, and spreads over the ceiling, warming that, and soon by downward radiation from the ceiling, and farther motion and mixing of the air, from the descending currents produced, because the walls absorb the heat of the air which touches them, the whole room is more or less equably warmed. The difference of sensation experienced by a person entering a room heated to a certain thermometric degree by a stove, and a room heated to the same degree by an open fire, depends on the air being somewhat warmer, and the walls somewhat colder, in the first room than in the second. A small stove at a high temperature, gives out as much heat as a large stove at a low temperature; but there are great advantages in using a stove of full size—as, that its moderately heated surface cannot injure the air of the room— that there is economy of fuel, because the air leaving it towards the chimney carries less heat to waste, and that it acts more steadily from being less quickly either heated or cooled.

Sufficient ventilation for an ordinary sitting-room will be ensured, in a cold winter day, 1st, by the demand of air for the combustion in the stove; 2ndly, by the considerable change occurring through the crevices around doors and windows, which may be taken at about six cubical feet a minute for each; and, 3rdly, by the hundreds of gallons of fresh air, which, every time the door is opened, enter and displace an equal quantity of the air previously in the room. In warmer weather, when the difference between the external temperature and that of the room is less, and there is, therefore, less tendency to spontaneous change, some additional means may be used from among those to be described hereafter.

These remarks are followed up, showing how the stove may be adapted for warming and ventilating a suite of rooms, a very large room, school-rooms, concert or assembly-rooms, courts of law, churches, houses of parliament, theatres, and other buildings. Directions are given for *manufacturing, fixing, and using the thermometer-stove,* which may be easily understood by any workman.

A great object sought in the construction of the stove was, that when the stove reached any desired degree of temperature, there should be, in or about it, a thermometer capable not only of indicating the degree of temperature

reached, but also of doing the work of moving a valve to check the admission of air, whenever the heat were at all above the degree desired, and of increasing the admission when the heat fell below that degree.



This cut exhibits, perhaps, the simplest form of the expanding air regulator; *a b c* is a bent glass tube, closed at *a*, and open where it is cup-shaped at *c*. The bottom part, *b c*, has mercury in it. The part *a b* is placed within the stove. Over the cup *c*, and dipping into it, is the mouth of the tube, which admits air to the stove. When the stove is heated, the expanding air in *a b* depresses the mercury in *b*, to raise it in *c*, until it approaches or reaches the mouth of the air-tube, and so arrests the entrance of air. In this form there is no moving part or friction, but in the rising fluid, the surface of which is, in fact, the valve plate or stopper, and it cannot fail to act. Common oil would serve in it nearly as mercury, rendering the apparatus very cheap. To enable persons by this regulator to fix the heat of the stove at any desired degree, the mouth of the air-tube *c* is made to slide or screw up and down, so as to be approached by the fluid at a higher or lower degree of heat.

There is much valuable matter connected with the philosophy of warming and ventilating of buildings to be found throughout the treatise; it is a work which ought to be in the hands of every member of the profession.

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS, No. 3.

THE ROYAL EXCHANGE.

The fire which happened on the night of the 10th of January, and of which such flaming accounts served for nearly a week afterwards to fill the newspapers, leaves me no choice of subject for this number. Not to speak of that "splendid edifice," as the newspapers have been pleased to style it, would be turning from my door a very good chance of being read; because, although nobody perhaps would have cared at any other time to learn my opinion of such a stale, antiquated pile, it has now all at once—thanks to the chapter of accidents—become a remarkably attractive and interesting subject! That the late Royal Exchange was *splendid* I do not deny, provided I may be allowed to limit its claim to such epithet to one particular occasion—namely, when it was all in a blaze. Splendour at any other time it was never my good luck to detect in it; on the contrary, I could never help fancying that its newsvenders' shops, and others with which its exterior was blocked up below, gave it a very pedlar-like appearance.

However, before I proceed to examine and cross-question the building, let me call into court one who has something to say as to its general character; a no less respectable and worthy personage than my own predecessor—my literary ancestor by my own voluntary adoption—namely, Ralph the First, or as my title would indicate him to be, Ralph the Defunct. Well! what does he say?—"Upon the whole, the entrance into this building is very grand and august. The two statues which adorn it are in a particular manner beautiful and admirable; but then the tower,"—he is speaking, gentlemen, of the former tower—"which arises over it, is a weight to the whole building, and is at the same time broken into so many parts, that it rather hurts than pleases, and if reduced to one-half of its present height, would harmonize abundantly better with the whole. The inside is light and airy,"—troth! he may well say airy, since there was nothing to keep out either air or weather,—"laid out in a very good style, and finished with great propriety of decoration. I could wish, though, either that the statues were executed in a better manner, or that the City would condescend to excuse setting up any more, for nothing can be more ridiculous than to hurt the eye with a fault in the affectation of beauty."

Ralph the First, you may now retire, and make way for Ralph the Second. Well, now that we have heard what old "Squaretoes" had to say, let us sift the matter, and begin by looking at that front, whose entrance he has pronounced to be "very grand and august." And so, truly, is my Lord Mayor's state-coach; but then, as Squaretoes himself says, its grandeur is of that awkward, floundering, cumbersome, old-fashioned shape, that people are apt to laugh at it.

Nothing is more easy than to apply some magnificently laudatory epithet to the edifice here noticed, for ready-made commendation may be got at out of any history or picture of London; the difficulty is to show that it is awarded by good taste and sound criticism, which is what the books in question never attempt to do, neither can I at all assist them. In my opinion *bizarre* would be by far a more appropriate title for it, for the Royal Exchange might convince the most sceptical, notwithstanding Sir Christopher's maxim, that architecture does not admit of fashions, there have been very whimsical fashions in it ere now. This is attested by more than one of Wren's own buildings, even without giving him the "credit" of the design for this, which has been claimed for him by a writer in the Gentleman's Magazine (December, 1827), after Mr. Brayley had taken some pains to show that it rightfully belonged to some city surveyor, named Jerman. In the scale of criticism, it matters not one grain whether it was Wren or any one else who was the author of the design; therefore the reader shall not be bored here with any discussion relative to that minutely interesting point, my business being with the design itself. And, first, for the Cornhill front: this was not according to the original design (which may be seen in Campbell's Vitruvius Britannicus), having undergone a good deal of alteration; and some one, I find, has been altering it since the fire, giving what it never had before, namely, "a tetrastyle portico"! so at least the "Mirror" describes it, owing, perhaps, to some odd metamorphosing power it possesses in reflecting objects.

In its first shape this front had, besides a spire-like tower of three stories, the lowermost of which contained a mullioned window, forming two arched openings with a circular compartment above them, an ugly tall lantern, covered with a bell-shaped roof at each extremity of the part projecting from the main building. These last had been removed altogether, and the tower was taken down and rebuilt some years ago, after a design by Mr. George Smith, which, although not without a certain degree of heaviness, partly occasioned by there being arched windows between the columns, was in better taste than the original structure. At the same time this centre compartment of the front was pruned of some of its excrescences, by taking away the barbarous semicircular pediment which used to be over each of the side intercolumns adjoining that containing the large central archway, which, independently of their uncouth form, gave the middle intercolumn the appearance of being a mere space coming in between two compartments, each consisting of two columns, crowned by the aforesaid pediments, and thus cut up the whole into three distinct portions.

The removal of these disfiguring excrescences helped to render this centre division of the front somewhat more connected, although owing to the entablature not being continued in an unbroken line over the four columns constituting the larger order, but carried only over the side intercolumns, and receding above the middle one, the want of continuity was here more observable than agreeable. After all, this was a trivial blemish, in comparison with the lumpish taste which displayed itself in the decoration, as we suppose it must be termed, of the intercolumn on each side of the centre one. Here, instead of the rustic surface of the wall being continued throughout the whole space, it was carried only a little way beyond the columns, so as to form wide piers, against which the columns were placed, and into the interval between these piers was crammed an ill-proportioned doorway below, with a broken scroll pediment coming against the pedestal of a niche with diminutive columns, and surmounted by a pediment somewhat similar to that of the doorway; and lastly, cutting into this second pediment was a small circular window. Thus doorway, niche, and window, were piled up one on the other, so as to produce one of the most heterogeneous jumbles in the very worst mode of Italian architecture. All this was so glaringly bad, that at the present day the veriest novice would have been heartily ashamed of such a patchwork medley; at the same time, the remedy for it was easy enough, nothing more being required than to cut away all that architectural farrago, and either make these lateral intercolumns quite solid, and continue the rusticated surface; or, if there must be doorways to enlarge them, giving them a handsome entablature, whose cornice would have continued the line of the impost of the centre arch; and the space above might have very well been filled up entirely with large bassi-relievi, in which situation the sculpture could have been far better discerned than in the panels of the attic behind the balustrades, and attached to the lower part of the tower. Had this been done, the line of the impost to the great arch would have been carried uninterruptedly throughout the whole front, because in the parts on either side of the centre it formed the cornice to the arcades. Yet if thus far the original design admitted of being corrected with very little trouble or expense, there were radical vices in it, which bade defiance to any kind of amendment short of recomposing the whole façade; because the capitals of the larger order did not even rise up to those of the smaller one above

the arcades on each side of it, so that the centre appeared to be depressed in comparison with the parts adjoining it, at least as far as the respective orders addressed themselves to the eye; whereas, the lower edge of the architrave of both orders should have been on the same level, or better still, the entablature of the larger one should have entirely cleared that of the other. Even when we come to examine the lesser order by itself, there is much to censure in its application, not that I intend to object very strictly to the liberty taken in grouping each column with two half pilasters, since that was by no means the most objectionable liberty taken by the architect; on the contrary, while it produced some degree of richness, it served in some degree also to narrow the intercolumns, and to make them not appear extravagant when measured by the breadth of the cluster composed of column and pilaster combined. Still, notwithstanding this artifice, for such we may allow it to have been, the intercolumns were nearly as wide as they were high. This was bad enough; yet it might have been partially remedied—rendered a degree less offensive, had the windows been somewhat tolerably proportioned, not to the width, but to the height of the spaces they occupy; whereas, by being made broad and low, though their large apertures rendered the part above the arcades actually less heavy than would have been otherwise the case, they had in themselves an air of clumsy heaviness, the very reverse of what is understood by *lightness* in the æsthetic import of the term. Nor was the offensive heaviness which here manifested itself at all lessened by coming immediately in contact with the arcades below, which were as strongly marked by the opposite character; and, except that the piers were rather too slender, these last-mentioned portions were the least exceptionable of any in the whole design. The shops within them certainly did not anywise contribute to architectural effect; let us therefore hope that the omission of them will be made a *sine qua non* in the instructions to architects for the new edifice. In regard to the north front, I shall merely observe, that it was many degrees inferior to the other, much more lumpish and deformed, and crammed in places with ugly little circular and oval mezzanine windows. It had, too, a very bad opposite neighbour in the Bank, the style of whose architecture did not act as a foil to set it off to the best advantage. For the matter of neighbourhood, however, the Bank itself had no great reason to be better pleased with the Exchange, since the latter building obtruded itself upon it very awkwardly and disagreeably. Of course, the want of parallelism between the two buildings will now be remedied, much to their improvement, and that of the street between them.

The interior of the Exchange may be soon dispatched. It was, in my eyes at least, nothing more than a dismal court, in a style of architecture for which hideous would be hardly too harsh a term. In its ornaments it had all the littleness and confusion ascribed by some to those of Gothic buildings, without their homogeneousness, and their propriety or their effect. Bookmakers, and critics of the Squaretoes school, assure us that it was adorned with two orders, Doric and Ionic; and truly there were Doric columns, and, if we looked narrowly enough, we might discern, stuck up at intervals, "few and far apart," certain diminutive stripes on the wall, that might pass for pilasters, and, in the imagination of some, for Ionic ones. In such matters, imagination will undoubtedly do a great deal, and enable us to see, like Polonius, what is "very like a whale indeed!" To describe all the odd whims and caprices here jumbled up together, otherwise than by means of a drawing, would be quite impossible; neither can I refer to the "Vitruvius Britannicus" as supplying an accurate delineation of this part of the structure; because, like many architectural works since its time, that is exceedingly sparing of sections, and has not given one of the Royal Exchange, unluckily, perhaps, for our curiosity, yet luckily enough for the reputation of the building itself and its panegyrists. Suffice it then to say, that there was no lack of finery. There were curved pediments filled up with dabs of festoons clapped about circular windows, and an abundance of small oval windows, placed so as to cut through both the architrave and the frieze of the upper entablature!! After this last remark, I need make no further comments on the taste that was there displayed; and it may, perhaps, serve to moderate the somewhat unphilosophical lamentations and bewailings of those whose pathos and patriotism combined have endeavoured to persuade us that the late "awful conflagration" has bereft us of a pile of such superior grandeur and beauty, that we ought to despair of beholding aught that can in any degree rival it. After all, I should be loth to destroy any body's pleasing illusions in regard to the Royal Exchange, or any other building upon which I may offer my remarks. I do wish, however, that those who are so exceedingly lavish of their praise in the lump, would not be quite so sparing of their ink, but condescend to edify such obstinate blockheads as myself, by pointing out, one by one, the beauties their more fortunate eyes are able to detect and discern.

NEW INVENTIONS.—No. 2.

BY PHILOTECHNICOS.

We are always pleased to hear of artists devoting their time and attention to the study of that branch of the arts that is considered by many of them to be derogatory to their calling;—we mean the art of decoration, as applied to the ornamenting of the interiors and exteriors of buildings. How this false pride arises we cannot imagine; for what is the tendency of all their works but to this particular end? Are they not now applied to the decoration of galleries and drawing-rooms, or to the closet of some great collector, dealer, or virtuoso? Where is the vast difference of pictures being hung up upon walls and bedizened with gaudy frames, or painted on the very panel or wall of the room itself? Where is this mighty degradation, where this *infra dig.*, that should so humble the aspiring knight of the pallet, that he will not deign to apply his talent to "the art of decoration?" Is it in the application of his utmost skill and ability to the adornment of a ceiling, or an altar of a church, or the grand staircase of a public building, or of the walls of a sumptuous palace or splendid mansion? Are not these frames much more costly and magnificent than a mere gilded border? Not that we would detract for a moment from the merits of the many beautiful creations of poetic fancy that are daily produced—far from it; our desire is only to uphold the superior nature of this particular employment, and a wish to see it much more encouraged than it now is; and we hope, by the dissemination of the enlightened policy of the present day, to see these false barriers cleared away, and the road again opened for the honourable reception of the "great men" of this talented age. Is not the name of a "Raffaelle" a sufficient guarantee for the high character this employment once assumed, when his principal, nay, his very best works, were produced when exercising the art of decoration; neither did a Michael Angelo, Rubens, Titian, Leonardi di Vinci, the Caracci, Paul Verenisi, and a whole host of other great painters, think it beneath *their* dignity to employ their time and talent to this particular art; but we need not go so far back for examples, when the name of Thornhill stands, in England, pre-eminent for his works, which now remain as a *memoria menti* of the perfection that the art in this country had once attained.

The beautiful ceiling of the Banquetting House, now Chapel, at Whitehall, by Rubens; the grand staircase of the British Museum, by De la Fosse; the dome of St. Paul's and the walls of Greenwich Hospital, by Sir James Thornhill; and many other public buildings, need only be noticed to support the importance of the art of decoration.

We have been led to make these remarks, by having lately seen the productions of many talented men devoted to this particular branch, which we propose to introduce, through the "Journal," to the professional and scientific reader, hoping thereby to be the means of extending its introduction and use throughout this improving country. We will commence with the works of Mr. Latilla on

Fresco Painting.

This kind of painting is most admirably adapted for the decoration of public buildings as well as of private dwellings; heretofore, the profession have been baffled in recovering the art of fresco painting, that has, for many ages, been almost in abeyance; but, thanks to the perseverance of Mr. E. Latilla, it is again revived, and we hope, ere long, to see the ceilings and walls of our many public and private edifices brilliantly illumined with this beautiful and lucid style of colouring.

Fresco is much superior to oil for large surfaces; the latter has a heavy appearance, and requires powerful varnish to bring it out, creating a glare and reflection of light which impede the sight, and render it impossible to view it, except at certain angles of vision. Its durability is, moreover, comparatively short, and it is but with great difficulty and judgment that it can be made to retain its richness of tone and colour. Fresco, on the contrary, as is proved by the beautiful works of the ancients in Pompeii, Herculaneum, and elsewhere, and by the master pieces of art of Raffaello, Corregio, and Michael Angelo amongst the Italians, has none of these disadvantages, while it is far richer in tone, more brilliant in colour, and will endure for ages.

Mr. Latilla appears to have long studied the art of fresco painting, and has produced many very beautiful imitations of the arabesque, Louis Quartorze, and Elizabethan styles, and is now training several clever young artists to assist him in producing works which, we hope, will ultimately vie with the splendid productions of early days.

The plan adopted by Mr. Latilla is to prepare a ground with two or three coats of colour, in a similar manner to that recommended in one of the early numbers of the "Journal," which we are happy to have been the means of communicating, namely, by using a roller covered with felt. The machine Mr. Latilla used was exactly similar to a child's toy, the little garden-roller, being about eight inches long and two inches diameter, with a long handle. This rolled over each coat in succession, after being painted in the usual way with a brush, produces a beautifully smooth surface, without the least appearance of the brush marks. We strongly recommend the adoption of this simple method for the painting the walls of staircases, dining-rooms, &c., which is so much superior to the old method, and so easy in its application, that were it once adopted, we are persuaded no man of taste will ever adopt any other. After thus preparing the walls of the required tint, he divides them into compartments by pilasters, enriched on the face with arabesque, or other foliage; and in the centre of each compartment he introduces a picturesque landscape and figures, or an allegorical subject. The ceiling he enriches with a foliaged border and angular ornaments, and, in the centre, with an aerial figure or centre flower. There are various other methods of decorating the rooms, either by forming panels on the walls, or festooning the upper part with fruit and flowers, or by introducing trophies and other ornaments, according to the taste of the owner or style of the

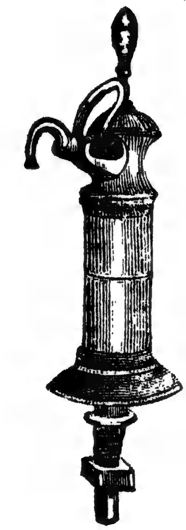
building; but, generally speaking, we would advise the greatest latitude to be given to the artist, who, by long study, ought to be best acquainted with the proper taste and style required.

Mr. Latilla has fitted up a room in this style at his residence in Howland-street, which he exhibits to all who are desirous of a better acquaintance with this kind of decoration. We have seen it, and recommend others to do the same, as it will convey some idea of the perfection that may be attained, where the means are not too limited; though for small houses a neatness, nay, elegance may be attained, at a comparatively trifling cost, the price not being much more than best paper-hanging, or graining. For old wainscotted rooms, it is by far preferable to the present heavy and monotonous method of painting, as the panels may be beautifully ornamented in fresco with foliage or landscape, and the styles and rails enriched in arabesque. We shall conclude this notice by advising the profession to examine into the merits of fresco painting, and to introduce it where such an opportunity occurs, being convinced that it only needs to be seen, to be admired. We wish Mr. Latilla and his pupils full success, and shall do our best, by reverting again to the subject as occasion may require, to assist him in his enterprising career.

Since writing the above remarks, I am informed that Mr. Ward is engaged to paint an historical subject for the ceiling of a room for Earl de Grey; that Mr. Paris is now employing his great taste and ability to the decoration of the Great Western Steam Ship, which is to be finished in a very superb manner; and that Mr. Eastlake painted, some time since, some rooms in the Herculaneum and Pompeian styles, for B. Kerr, Esq., in the Regent's Park; thus again are we gratified to hear of three eminent men lending their aid to the art of decoration.

We will now change our subject by running over a long string of new inventions, and select one or two, that may be considered as novelties.

Stocker's Patent Hydraulic Machine.



This machine consists, as represented in the annexed engraving, of a neat brass cylindrical standard, 13 inches high, and 2½ inches in diameter, and is intended as a substitute for the common beer machine, and is particularly applicable to dressing-rooms, where the cistern is in a lower story. It is small, simple, and ornamental. For taverns it will be found very useful for drawing beer or spirits, or for water to supply the counter or washing-stand. The stroke is regulated to draw exactly half or a whole pint at one pull; and every part of it can be unscrewed to clear out any dirt or other obstacle that may have got in, particularly the lower valve, which can be easily taken out, wiped, and replaced. It requires no stuffing-box, as the present beer-machines do; it is easily fixed to a counter or wash-hand stand, and is attached to a ferrule (previously soldered to the pipe) by a union nut and screw, and can be as easily removed.

Warming and Ventilation.

The number and variety of schemes for accomplishing this object is almost incredible. We have witnessed many of very original character, which is naturally to be expected, when we know that most of the scientific and learned men, as well as those of good practical knowledge, are all hot upon the subject, and are daily rivaling each other in producing their bright ideas to illumine the public mind upon this all-absorbing topic, which the several names of Arnott, Joyce, Perkins, Bramah, Price, Thompson, Cottam and Hallen, Ure, Sylvester, Hood, and many others whose names are familiar to your readers, will fully testify. Those possessing the most novel features, are the productions of the two first named, Dr. Arnott and Mr. Joyce. The stove invented by the former we will but merely notice, as having seen and admired it, for doubtless you will better describe its valuable properties in a review of the Doctor's work lately published upon the subject. With regard to Mr. Joyce's apparatus, which we have lately seen, it having been exhibited at the Institutes of Civil Engineers and of the British Architects, we will briefly describe, for the information of those readers who may have not yet seen it. It is of an upright cylindrical form, of bronze, with an ornamental top and tripod stand; a band encircles the middle, to which two handles are attached. The whole is very much in the form of an old-fashioned upright coffee urn. A small pipe admits air from the bottom, which passes through the fuel, and escapes by a valve at the top: this valve can be so regulated by raising or depressing it, as to create any degree of heat; but the heat generally required is about 400°, radiating from the sides, and to which, on applying a piece of paper, it will scorch, but not ignite. This apparatus, the inventor states, he has constantly used in his bed room, without experiencing the slightest inconvenience or any ill effects from the combustion of the fuel, which does not contain any deleterious qualities: the invention is the result of fourteen years' continued experiment, and he has only been prevented heretofore (like many others of his class) from obtaining a patent for want of pecuniary aid. Many have been the conjectures upon the nature of the fuel used, and many experiments have been tried by practical men to obtain similar results. Among the materials experimented upon are coal, coke, charcoal, ashes, and turf, with admixtures of lime, salt, saltpetre, and vitriolic acid, in various proportions and mixed in a variety of ways, and many valuable results have been the consequence. The fuel, we understand, is vegetable charcoal, so prepared as to give out no carbonic acid gas; but the way in which the inventor accomplishes this, he still withholds from the public: his plea is, that he has not yet quite secured his foreign patents—it would have been much better had he secured them before he exhibited his invention to the public. I would advise him not to lose much more time, or he will certainly, ere long, have many formidable rivals to compete with: Dr. Arnott's stove is already in the field, for which there is a very great demand. The fuel for the apparatus is intended to be sold at various depôts throughout the kingdom; if so, we would recommend the greatest caution to be used to guard against its adulteration, and that it be sold in *sealed* cases, so as to prevent the possibility of agents adulterating it; nor should this suffice, for the consequence, if such were the case, might be fatal to the consumer, who should be prepared with some test to detect the presence of carbonic acid gas, by which he might be able to judge for himself whether the fuel be properly prepared.

PARIS.

Embellishments of the Place de la Concorde.—Nothing as yet has been determined upon—at least nothing authentic has yet transpired, in regard to the mode in which the area of Trafalgar Square is to be laid out and decorated; but perhaps some hints might be taken from the very extensive embellishments now in progress at the Place de la Concorde, under the direction of M. Hittorff. In the centre of this place, which extends about 1,200 feet north and south, between the Guarde Meuble and Rue Royale and the Seine, stands the Luxor Obelisk, the erection of which was conducted by M. Lebas, Ingenieur de la Marine. This antique monument will form little more than a single central point, in comparison with the numerous other objects that will shortly surround it; for it is intended to form a spacious avenue leading from the Rue Royale to the Pont Louis XVI., having two fountains, one on the side next the above-mentioned street, the other on that towards the bridge. These fountains will be upwards of seven metres, or twenty-two feet English high, and will each consist of two elevated vasques or tazze, the upper one of which will be three and a half metres (above eleven feet English) wide, and the other six metres. The first will be supported by three *genii*, with festoons of foliage between them, below which will be three swans spouting out water. The larger vasque will be sustained by six draped allegorical figures standing on the prows of vessels, that will appear to be immerged in the water received into the larger basin at the foot of the fountain. Between these six figures there will be as many dolphins, which, like the swans, will spout forth streams of water. In addition to these, there will be six other large figures in the basin, three representing Tritons, the rest Nereides; so that altogether there will be fifteen statues, besides swans, dolphins, and other sculpture, to each fountain. All these figures are to be cast in metal, and a good deal of the work is already far advanced. Even one such fountain would be considered a splendid undertaking in this country, and quite sufficient of itself without any accessories; what then will be thought, when we add, there will likewise be twenty rostral columns nine metres high, and forty candelabra? All these columns and candelabra will be cast in metal, which is to be partly bronzed and partly gilt, the bronze colour serving as ground to the gilding on the ornamental parts; and the columns as well as the candelabra will be lighted at night with gas, issuing from the projecting prows on their shafts. The effect, therefore, will be remarkably gay, not only on account of the brilliant display of light, but of the mode in which it will be applied, and the objects shown by it. In fact, the whole place will exhibit a complete illumination every night; yet, as if this would not be sufficient, the splendour will be increased on particular occasions and rejoicings, as the ball on the summit of each rostral column will have eight gas-burners, which will be lit at such times, so that the increase will be equivalent to that of one hundred and sixty additional gas lamps.

The model alone for the columns is said to have cost 27,000 francs, whence it may be supposed that the design is exceedingly rich. The weight of each is 4,200 kilogrammes, and that of each candelabrum 995; of these latter, there will be four around the pedestal of the Obelisk, and eight around each of the fountains. The improvements on this spot will not be confined to the above-described embellishments, for the chaussées or walks, intersecting the *Place*, will have trottoirs of granite; and the ground enclosed by the fossés, will be laid out in grass-plats, parterres, and low ornamental shrubberies, so as not to screen any part of the general plan.

We are of opinion, that something of a similar plan would be very suitable for Trafalgar Square; and were we permitted to offer our advice, we should recommend, that instead of following the general descent of the ground, the enclosed part should be a perfect level or esplanade, so as to form a terrace elevated several feet above the pavement at Charing Cross. The balustrade of this terrace might be continued along the other sides of the enclosure, and the whole would thus possess a different and more architectural character than the gardens of our squares. A rostral column in the centre would not only be appropriate, as emblematic of the victory at Trafalgar and other naval achievements, but be a novel and picturesque object in itself, such form being infinitely preferable for an ornamental monumental shaft or pillar than a mere column, looking as if it were a solitary member detached from some gigantic edifice, without having undergone any change to adapt it at all for becoming an independent and integral structure.

Madras Breakwater.—We understand that Government have received a despatch from the Court of Directors on the subject of the Breakwater, and that the Court have viewed the matter in a liberal way, expressing their willingness to take upon themselves the construction of a Breakwater, provided its feasibility can be made clear to them, and making the cost a matter of no consideration.—*Conservative*, Sept. 1.

CURTIS'S SAFETY IMPROVEMENTS FOR LOCOMOTIVES.

Fig. 1.

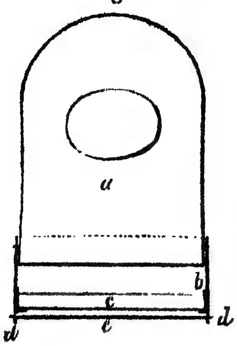
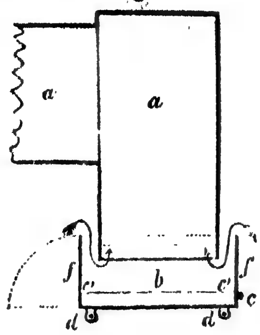


Fig. 2.



Ash-box consists of a movable tray or pan, which slides longitudinally either forwards or backwards, as may be required for discharging the fire. Two sides, with ledges for the tray to slide upon, are fixed to the sides of the fire-box, and united by tie-bolts at their extremities; two flaps, or doors, are provided at each end; so that which ever way the engine may travel, one may be open to catch the wind, and the other closed, to prevent dust escaping, or they may be both closed. The sides of the flaps rise higher than the bottom of the fire-box, so that the escape of cinders is impossible. The tray has all the four sides raised about two inches high, so that any escape of water from the fire-box is received into it, the steam from which very much assists the fire. The adaptation of this contrivance, and also the spark arrester, is very much called for, as I perceive, by the public papers, a farm has been burnt down, on the line of the London and Birmingham Railway, from sparks of fire from an engine.

Reference to plate, fig. 1 *and* 2.

a, is the fire-box and boiler; *b*, the sides of ash-box; *c*, tray; *d*, extremities of sides, through which the tie-bolts *e* pass; *f*, the flaps which have hinges at *c' c'*. The direction of the draught is shown by the curved arrows.

Apparatus, to counteract the effect of the frost upon the axles of locomotives (fig. 3), consists simply in suspending a trough below the axle, supplied with coke or charcoal; this is formed with plate iron, of the figure shown in the drawing. The fuel may be twelve or fourteen inches from the axle. A grate, formed of a piece of sheet iron, perforated with holes, passes the entire length between the axles, and the whole apparatus is suspended as close to the wheels as possible. The outside bottom, which forms the ash-pan, may be two or three inches from the grate, with raised ledges, to prevent the ashes falling out. A bushel of coke will last about three hours, for perhaps eighty miles. If found necessary, the same apparatus may be attached to the tender axles, as is evident.

Reference to the plate.

a, wheel; *b*, axle; *c*, suspended trough, with fuel; *d*, ash-pan, or lower bottom; *e*, a jointed rod connected with part of the frame or boiler, by which the apparatus is kept steady.

Fig. 3.

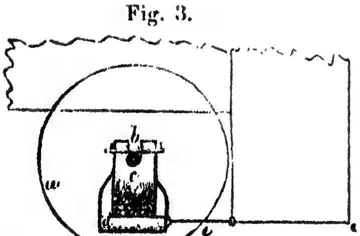
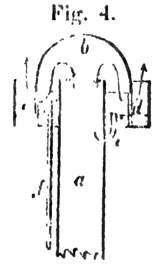


Fig. 4.



Spark arrester (fig. 4).—This contrivance consists of a dome placed over the top of the chimney, supported upon bolts, fixed in the bottom of a receiver, or water-vessel, by which means the sparks and dust from the fire are thrown down into the receiver, and there extinguished. This will be clearly perceived by reference to the plate, where *a* is the chimney; *b*, the dome; *c*, the receiver; *d*, the holding-bolts, or pillars; *e*, the escape-pipe, for the excess of water, the end turned up within the chimney; *f*, the feed-pipe, from the force-pump, by which a constant supply is kept up within the receiver: this pipe is connected with the pump behind the last valve; thus cold water is used, and there is no abstraction of heat from the boiler. The direction of the steam is shown by the curved arrows. This apparatus was at work for some time upon the Greenwich Railway, and answered perfectly; it does not impede the action of the engine in the least. I could never force a spark from it when the receiver contained water, as Messrs. G. Rennie and other gentlemen have witnessed, upon one occasion, when they went down the line upon the engine for the purpose of witnessing the experiment; not only are the sparks arrested, but the dust also, so that that very great annoyance is entirely removed. If it should be found necessary, a flap, or cover, may be placed upon the top of the dome, which may be opened when the steam is getting up, and closed when the engine is at work. It is scarcely necessary to observe, that the area between the dome and chimney, and between the dome and receiver, must always exceed the area of the chimney. W. J. CURTIS.

RAILWAY CHAIR.

Sir,—I observe in your last Number, a letter from Mr. Scott of Manchester, calling in question my right to be considered the author of the railway chair and mode of fastening, published in No. 4 of your Journal. He says, a chair, "with a place for the key rounded in the middle, has been used nearly two years, for the strong rails which have *lately* been laid down to replace old ones, in the Liverpool and Manchester Railway." This is very probably the case, but these chairs cannot be rounded in the way I propose; because, if so, and the rails are fastened without the wedges, a very absurd mode is adopted indeed. I recommend Mr. Scott to read the description of my chair again, and then he will find that the rounding the place for the wedge is useless, without the wedges on each side to spread out the timber, so that the contraction and expansion of the rail, and the traffic over it, may not affect the fastening. It is clear, again, that there can be no similarity in our methods, inasmuch, as his proposal to key his wedge was not, and has not, been adopted. as to priority of thought, I proposed to fasten all the chairs on the Greenwich Railway by this method fifteen months ago, and my method was published in the *Times* newspaper more than six months ago. The idea, that I could have obtained the secret from Mr. Scott, removed more than 200 miles from him, whom I never have seen, nor perhaps ever shall see! I have never been to Manchester, and only saw the Liverpool end of the Liverpool and Manchester Railway for about half an hour, upon one occasion. However, the fact for the public to know is, who published the matter first? he is *de facto* the inventor in all cases. A valuable secret is of no value to those who do not know it; I therefore advise Mr. Scott, if he has any other inventions, to lose no time in publishing them, lest he should be forestalled a second time, and if worth the attention of your Journal, I have no doubt you will be happy to afford him every facility for that purpose. Yours, &c.

1, Stafford Street, Bond Street. W. J. Curtis.

CONCRETE AND ARTIFICIAL COMPOSITION FOR BUILDING PURPOSES.

Sir,—I am not engaged in any trade or profession, but I reside on my own lands, in a district of much picturesque beauty, and abounding with chalk, flints, gravel, and sand, but entirely without building stone; and I have for some time endeavoured to ascertain the best materials and method for making a concrete or artificial stone of good appearance and durability, capable of resisting pressure and the weather, especially severe frosts, which so powerfully affects those of which the chief ingredients are lime or clay, whether in natural or artificial combination; but although I purchase most of the books* (of which I hear) treating on such subjects, yet the result of my inquiries hitherto has been by no means satisfactory.

Amongst other compositions recently brought into notice, are—

1. The French asphaltic mastic, which appears to be composed of tar and lime naturally combined, but too dear for extensive use here.

2. Cassell's patent lava, which seems to be tar without lime, and, perhaps, for want of that combination, to have not answered on the Vauxhall road, near the bridge, so well as had been expected.

3. Ranger's artificial stone, which is little more than a common concrete, mixed with a rather more than usual care, moulded and set with hot water.

I am rather disposed to attribute the superiority of the asphaltic mastic over Cassell's and Ranger's compositions to the former combining tar and lime naturally, which neither of the others do. I am the more inclined to this supposition, on account of the merit ascribed to a cement for which, in 1805, a Mr. Wilson obtained a prize from the Society for the Encouragement of Arts, and which consisted of boiled tar, with a little kitchen grease, used to mix slacked lime two parts, and finely powdered glass one part; and when made of the consistence of thin plaster, used to cover damp walls, or to join broken marble, &c. &c.; probably the grease was only (if of any use) to aid in repelling damp; and as to the glass, considering the nature of the materials of which it is composed, probably sharp sand would answer the same purpose, and then it might be made at a price and in a quantity suited for general and extensive use.

I enter into these details, and trouble you with this letter, in consequence of the notice taken in your January number of the asphaltic mastic, and in the hope that you may consider the subject of concretes and artificial building worthy of particular notice in your valuable Journal, to which, from its first number, I have been a subscriber and

A CONSTANT READER.

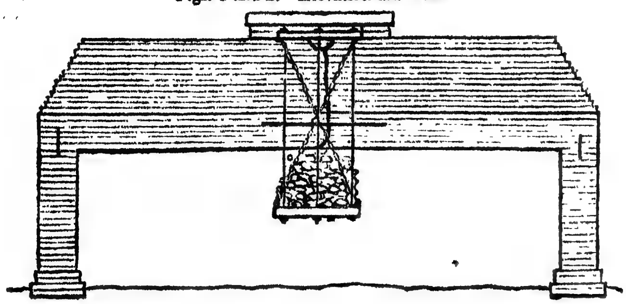
[We shall be happy to receive communications on concrete and other compositions suitable for building purposes.—Editor.]

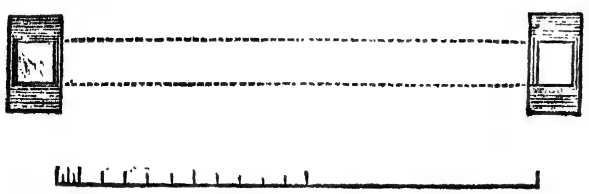
* A list of the books worthy of notice on such subjects would be useful, if inserted in your Journal.

EXPERIMENTAL BRICK BEAM.

ERECTED IN FRONT OF MESSRS. FRANCIS AND SONS ROMAN CEMENT MANUFACTORY, NINE ELMS, NEAR VAUXHALL BRIDGE.

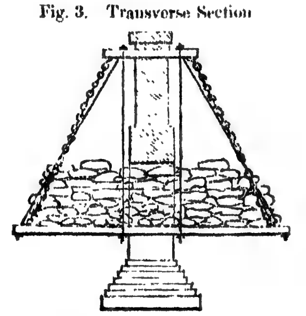
Figs. 1 and 2. Elevation and Plan.





Scale of Feet.

Fig. 3. Transverse Section



The above elevation, plan, and section, represents a beam or brestsummer, erected about two years since, by Messrs. Francis and Sons, under the direction of M. J. Brunel, Esq., to show the comparative strength of brick and cement, combined with hoop-iron. It was constructed of picked grey stocks, set with the best Roman cement, mixed with an equal proportion of sharp clean Thames sand; and in each of the lower courses of the beam, was embedded in the cement some iron hooping $1\frac{1}{4}$ wide by $\frac{1}{16}$ of an inch thick, laid horizontally, in all seventeen pieces.

The following are the dimensions: two piers, with three courses of footings 3 by $3\frac{1}{2}$ bricks, three courses $2\frac{1}{2}$ by 3 bricks, upon which stand two piers 5 feet high, 1 foot 7 inches or 2 bricks wide in the front, by 2 feet or $2\frac{1}{2}$ bricks thick; upon the top of the two piers was erected the beam, 21 feet 4 inches long in the clear, or 24 feet 6 inches out and out, 18 inches high, and 24 inches thick, upon which was erected a brick wall, 3 feet 3 inches high, by two bricks thick; a horizontal cement fillet was attached to the brickwork over the centre, and two similar vertical fillets at the ends; these fillets are marked with a dark line on the drawing, and were introduced to show when there was any settlement or deflection in the beam; over the centre a scale was suspended, in which was placed a quantity of scrap iron, weighing 10 tons 14 cwt. 1 qr. 4 lbs.; the greater part had remained suspended for nearly two years.

The ground upon which the beam had been erected being required for the terminus of the Southampton Railway, it was necessary to remove the same. Previously, Messrs. Francis and Sons were desirous of trying what additional weight would break the beam asunder; accordingly, a number of professional and scientific gentlemen were invited to witness the experiment, which took place on Wednesday, February 14, 1838, when the following gentlemen were present:—Messrs. Brunel, Donkin, F. Bramah, Sydney Smirke, Hardwick, jun., Spottiswoode, Taylor, Barnard, Brathwaite, Erickson, Lindley, Lowe, Herapath, Fox, Macneill, Riddle, Hawkins, Laxton, Higgins, Field, Rogers, Barnes, Pocock, Cottam, Manby, Lund, Mills, Garling, Webster, Willshire, Grimsdale, Hicks, Bellamy, Ward, Solly, Varley, Taylor, &c., &c.

About half-past twelve o'clock the experiment commenced. A line was first stretched across the underside of the beam, at a distance of three-quarters of an inch below the beam at each end, and only half an inch in the centre, indicating a deflection of a quarter of an inch, which probably was owing to an irregularity in the surface of the materials, as there was not the slightest appearance of any crack or fracture in any of the joints, or in the cement fillets on the face of the beam. A large quantity of railway bars were provided, and gradually laid on the scale, until the beam suddenly broke (about half-past two o'clock) with an *increased* weight of 11 tons 13 cwt. 3 qrs. 2lbs. Up to the time of breaking, there was no sensible deflection beyond what was perceived at the commencement of the experiment, nor any perceptible fractures or cracks in any part of the beam, or in the cement fillets. The beam broke as near the centre as possible, and the fracture run up to within a few inches of the top of the beam, when it divided, and forced out a wedged shape piece of brickwork, as shown in the drawing by a dark irregular line. It was a *clean* fracture across the brickwork; scarcely any of the cement joints were broken, which proved the goodness and efficacy of the cement; the piers remained firm until the moment of breaking, when the beam parted from them, at the horizontal joint on the top of the piers, and forced them both outwards. Most of the iron-hoops broke short off, one piece was drawn out about six inches, and another about three inches; they all appeared to adhere very firmly to the cement.

In addition to the foregoing remarks, collected on the spot at the time of the experiment, we have made the following calculations, to ascertain the comparative strength of the experimental beam of brick and cement with timber:—

	Tons.	cwt.	qrs.	lbs.
Weight suspended previously to the day of experiment	10	14	1	4
Weight added on the day of the experiment . .	11	13	3	2
Total breaking weight	22	8	0	6
Weight of the brick beam and brickwork over, calculating the quantity above, and *in the clear* of the piers, and allowing a rod of brickwork to weigh 13 tons .	8	2	0	0
Total breaking weight, 68,326lb. =	30	10	0	6

If we consider the size of the beam to be 21 feet 4 inches in length, being the distance between the piers, the breadth of the beam 2 feet, and the height up to the top of the set off 1 *foot* 6 inches, we shall have for the length (l) 296 inches; breadth (a) 24 inches; depth (d) 18 inches.

Breaking weight, (w) 68,326 pounds.

Now, if we take Barlow's formula for the strength of a beam supported at both ends, and loaded in the middle (vide Journal, No. 2, page 20), viz. $\frac{l\,w}{4\,a\,d^2} = S$, and substitute for this formula the dimensions and breaking weight of the beam, we shall have $\frac{292 \times 68{,}326}{4 \times 24 \times 18^2} = 641$ as the strength of the beam.

If, in consequence of the brick wall above the set-off, or above the part we consider as the beam, the weight is *equally distributed* over the beam, then it ought to carry double the weight of a beam loaded in the centre; in that case, we must divide 641 by 2, which will give the strength of the beam as only 320·5.

If we compare these results with Barlow's table of the comparative strength of timber (vide Journal, No. 2, page 21), we shall find that the experimental beam, according to the first calculation, is not much more than half the strength of oak or fir, and, according to the second calculation, is not much more than a fourth.

Then, again, we have heard it argued, that the whole height of the brickwork above the opening ought to be considered as the depth of the beam, with which we cannot agree; in that case the comparative strength will be very low indeed, as we must then consider the beam 21 feet 4 inches, or 292 inches in length, breadth 18 inches (the thickness of the upper part of the brickwork), depth the whole height 4 feet 9 inches, or 57 inches, plus the additional size of the lower part, 6 inches in width by 18 inches in depth; the formula will then stand thus:

$$\frac{292 \times 68{,}326}{4 \times 18 \times 57^2 + 6 \times 18^2} = S \text{ or } 82{\cdot}5:$$

thus it will be perceived the strength is comparatively nothing.

The next and most important consideration will be of what advantage are the pieces of hoop-iron which are introduced in the joints of the beam, and whether they act as a tie-bar.

We have fifteen pieces of hoop-iron, $1\frac{1}{4}$ by $\frac{1}{16}$, their aggregate equal to a bar of wrought iron $1\frac{1}{4}$ by $\frac{15}{16}$, or a bar $1\frac{1}{8}$ inch square; if they act as a tie in a state of tension, their strength will be equal to the cohesion of the bar.

According to the experiments made on the cohesive strength of an inch square bar of wrought iron, we have the mean result of

11	experiments	by Captain Brown	= 25 tons.
9	do.	by Mr. Telford	= $29\frac{1}{4}$
10	do.	by Mr. M. J. Brunel	= $30\frac{8}{10}$
4	do.	by Mr. Barlow	= $25\frac{1}{4}$
10	do.	by Mr. Telford on *wire* . . .	= $38\frac{4}{10}$

and, according to Mr. Barlow, we may consider the elastic power of good medium iron as equal to about 10 tons, and that the force varies from 10 to 8 tons in indifferent and bad iron.

If we take Mr. Barlow's result as the cohesive strength of a bar an inch square at $25\frac{1}{4}$ tons, it will give, as the collective strength of the fifteen hoops, very nearly 30 tons. If we refer to the total breaking weight of the beam, it will be found to very nearly coincide with the above calculation.

Now comes the argument, to decide in what manner the breaking weight acted on the iron hoops, and whether the iron could have been extended according to its elastic power, or whether, by the adhesion of the cement to the iron and brick, the bars were prevented being extended or stretched, and could only break when the force exceeded the whole cohesive power of the iron.

In the first place, if the iron had stretched, would there not have been a

fracture and deflection in the beam long before the breaking weight was applied? in fact, whether a deflection and fracture would not have been observed before the increased weight was added? as the weight which had previously been suspended, together with the weight of the beam itself, were considerably greater than the elastic power of the hoops.

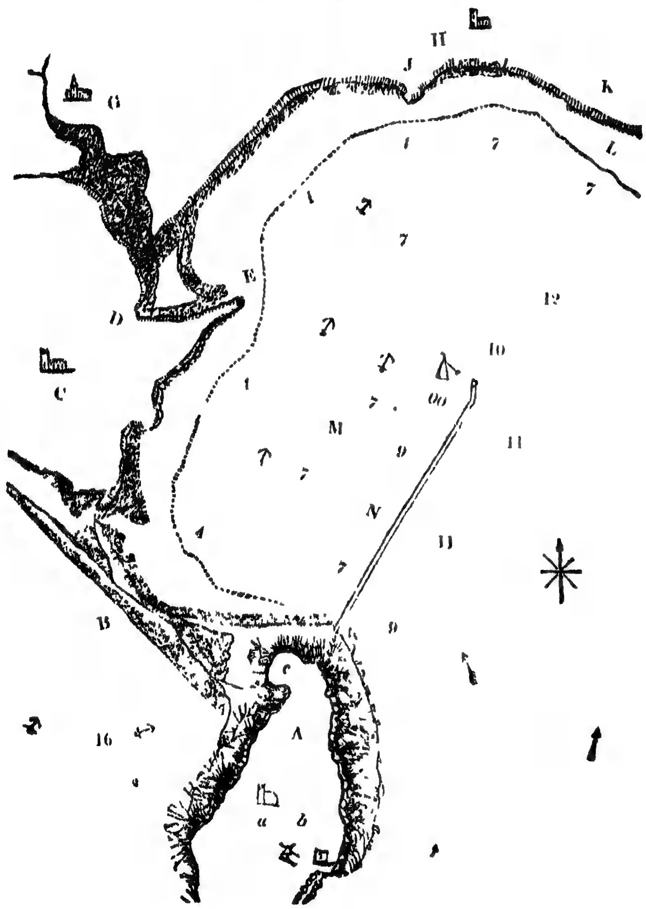
In the second place, if the hoop-iron did not extend before the beam broke, then it would require a force equal to the whole collective cohesive strength of the hoop-iron to break the beam.

The result of the experiment before us appears to bear out this view of the argument. In such case the bricks and cement are only necessary to prevent the extension of the iron, which is borne out by the result of Colonel Pasley's experiments (vide Journal, No. 2, page 30), viz., a beam without hoop iron was broken with a weight of 498 pounds, and a similar beam, with iron bond, was found capable of supporting 4,723 pounds; therefore $4,723 - 498 = 4,225$ the amount of strength gained by the use of iron bond.

[We shall be obliged for any remarks and calculations connected with the above subject from any of our scientific correspondents.—EDITOR.]

HARBOURS OF REFUGE.

PORTLAND HARBOUR.



EXPLANATION OF ENGRAVING.

A Isle of Portland. a New Church b Windmill c Stone Quarry. B Chesil Beach C Church Wyke Regis D Weymouth E North Point F The dotted line, showing the boundary of low-water mark G Radipole Church. H Preston Church. J Radcliffe Point K Mill Cove L Rigestead Ledge. M *Portland Harbour.* N The Breakwater. O Floating Light.

The *figures* indicate the sounding, and the *anchors* the ship's moorings.

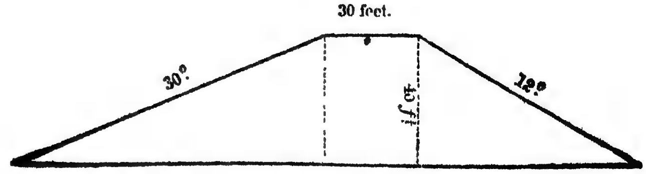
WE observe, that on the 21st of November last, Mr. George Frederick Young, Member of Parliament for Tynemouth, the intelligent and persevering advocate of the shipping interest, has given notice, that he intends, on the 1st of March, "to call the attention of the House to the expediency of making legislative provision for the construction and maintenance of Harbours of Refuge, on the most exposed and dangerous parts of the coasts of the United Kingdom"—a subject of vast importance to a maritime state, whose rank, influence, and importance amongst the great family of nations, depends so much on its marine, a force that cannot be either created or sustained, without an extensive and *prosperous* commerce. Sensible of this truth, great encouragement was heretofore given by former governments to the ship-owners of this country, under a system of laws generally denominated the Navigation Laws. These laws are either repealed or so altered, that the commerce of this country has now, under many disadvantages, arising from our erroneous system of revenue, to compete with other nations more fortunate in that respect than ourselves; it becomes, therefore, a subject of vast importance to the country generally, that its maritime strength should not be undermined and weakened, whilst that of other nations is increasing. To maintain its relative station, the maritime strength of this country must progress in the ratio of its superiority, and nothing will contribute more essentially to its success, than harbours of refuge, in the exposed and dangerous parts of the coasts of the British Isles, which vessels may enter, and from which vessels may sail at all times, free of expense.

Important, however, as harbours of refuge will unquestionably prove to the United Kingdom, yet the value of any *one* of such undertakings will *in general* depend on the proportion which the cost will bear to its value; though, in some particular instances, the value so far exceeds the power of calculation, as in the cases of Cherbourg and Plymouth, the cost is as nothing, when compared with the utility.

We have been led into these reflections by the perusal of two papers, published by Alexander Lamb, Esq.; the first entitled, "Suggestions for converting Portland Roads into a Harbour—1826;" and the other entitled, "Reasons for converting Portland Roads into a Harbour, showing that it will facilitate and lessen both the risk and outlay of commerce, benefit agriculture, reduce the expenditure of the country, and add to its security—1836."

The perusal of these papers led us likewise to make some inquiries respecting the two celebrated works abovementioned, the dike of Cherbourg, and the breakwater of Plymouth. The dike of Cherbourg was formed, in the first instance, of hollow cones of timber, filled in with loose stones, and upon the destruction of these cones, converted into its present form; the stones being left to the action of the sea, it is found that towards the roadstead or landward, the stones have maintained the angle of about forty-five degrees, but that, towards the sea, the angle has been reduced to one vertical for ten or eleven horizontal, which is probably a safe angle for a sea-slope, formed of small stones, there being few situations more exposed than the dike at Cherbourg; yet still the angle seaward must, in a great measure, depend on the weight of the stones, the rise of the tide, the velocity of the waves, and the angle at which the sea will strike it, under the influence of violent gales of wind. The Plymouth Breakwater, formed with stones of the average weight of three tons, has a sea-slope of about one in five, and towards the roadstead of the slope is about one to two. The casing of this breakwater, towards the sea, has been made with the heaviest stones, and the result of this judicious arrangement has been, that the tremendous swell setting into the harbour during, and after a high wind, has scarcely removed a single stone since its erection, excepting from the part above high water, which in the hurricane of 19th January, 1817, was destroyed to the extent of two hundred yards in length, and thirty yards in width.

If a breakwater be required merely to cover a roadstead or harbour, there is no necessity to raise it higher than one foot below low-water of spring tides. At Cherbourg the upper surface of the breakwater is very irregular, varying from three to fifteen feet below low-water mark; but the average may be taken at four feet below low-water, spring tides; and here it has been found that the roadstead is sufficiently protected to shelter a fleet of forty or fifty sail of the line during the heaviest gales, although the average rise of the tide is about twenty feet. Taking the proportions, such as those given in the Cherbourg and Plymouth breakwaters, the safe dimensions, as a general rule in practice, will be three-fourths the depth, for the width of the parallelogram, an angle of thirty degrees or slope of 1 in 2 towards the roadstead, and of twelve degrees or 1 in 7 towards the sea; thus the depth being forty feet, the breadth of the parallelogram will be thirty feet, as shown in the annexed diagram.



The action of the wind upon the sea is not instantly to break it into waves, a squall has the effect of merely blowing off the surface in spray, without permanently disturbing the quiescence of the mass. Water, like all other ponderous bodies, resists by its gravity the action of any force to disturb its equilibrium, and it is only after a violent wind of some hours' continuance that the sea rises; and those who have crossed the ocean, know well enough that the most dis-

agreeable waves are always produced after the gale is over, and the sea is subsiding by its gravity into quiescence.

The lower, or underside of a wave, has a less velocity than the upper; this is occasioned by the friction produced upon the under surface by the dead water or the shore, and the surface or upper part of the wave being acted upon alone by the impelling force of the wind, so that a wave always runs over itself; when the upper stratum reaches the extreme point, it falls over in foam, as over a precipice, the slower moving under stratum still keeps advancing, the wind gives a fresh impulse to the newly-exposed surface, and the action is again repeated: thus there is here a compound action; but when the wind has ceased, the active wave ceases, and then the heavy roll takes place, which a ship and the shore feel as much or more than the waves during the storm; and for this reason, after the wind has abated, the waves act upon the principle of a pendulum, with a certain degree of regularity, and uniting, the water rises against a wall or breakwater through a greater breadth: thus the wall or breakwater is exposed to a much heavier pressure than if the water were to spend its force against it in narrower waves, and the less exposed portion of the wall assists by its gravity and cohesion to sustain the shock upon the other part.

The wind is always intermitting in its action; were it not so, the water would rise to a height, and receive an impulse so immense, that nothing of human construction could withstand it.

Although it is a common expression to say that the sea ran mountains high, yet the agitated water never exceeds twenty feet in depth; and if we take its extreme horizontal velocity at ten miles per hour, or fourteen feet in a second, the pressure upon every foot of a horizontal surface will be near four tons—a prodigious force when spread over a large surface, but which is reduced almost to nothing by the sloping side of the breakwater, which reduces the mean depth of the water, and the velocity, at every period of the wave's progress, leaving only one foot of active water to flow over the breakwater, the effect of which will be destroyed as it rolls onward by the resistance of the dead water within the breakwater; thus the shipping in the roadstead floating the greater part of their depth in calm or dead water, remain in perfect security, and but for the action of the wind upon their hulls and rigging, would remain almost immovable even without an anchor.

The tides from the Western Ocean set into the English Channel in the direction of a line drawn from the Lizard Point, on the coast of Cornwall, to Cape La Hague, on the coast of France, nearly north-west by west; the consequence is, that the tides rise higher against the coast of France, and the isles of Jersey, Guernsey, and Alderney, than at any other point of the Channel; the average rise of spring-tide at Jersey being forty-five feet, Guernsey and Alderney thirty-five feet, Cape La Hague and Cherbourg twenty-one feet, whilst at Weymouth and in Portland Roads, on the shore directly opposite, the tide rises only from six to eight feet; thus the coast of France, from Cape Finisterre to Cape La Hague, is formed into a breastwork, upon which the force of the Atlantic is spent, throwing the water round in an eddy upon the British shore; so that Cape La Hague and Cherbourg check the tides and shelter Portland, and the shingle which is not left upon the French coasts is thrown behind the Bill of Portland, and upon the coasts of Devon and Cornwall, converting such of the harbours on those coasts that are not protected by some projecting head-land into *bar* harbours.

The idea of converting Portland Roads into a harbour of refuge for ships passing up and down the English Channel, is due to Alexander Lamb, Esq., who in the year 1812 arranged the plan in his own mind, and in the following year employed Mr. Dessiou, the hydrographer, to survey Portland Bay, and furnish a report upon which himself and friends might act. From the period above-mentioned to the present time, Mr. Lamb has employed a great deal of time and money in laying his suggestions before the Government and Parliament. He has collected such a mass of facts and evidence bearing upon the point, that in a desire to lay before the public the merits of this important work, we cannot do better than quote his own pamphlet, published last year.

By the addition of a stone reef or breakwater, raised one foot above low-water mark at ordinary spring-tides, to the natural boundaries of Portland Roads, and running in a north-eastern direction from the north eastern part of the island, a convenient and capacious harbour would be formed, at the comparatively small expense of £400,000, affording great extent of shelter and means of accommodation to every description of shipping, from the lowest to the highest class, and combining the singular facility of allowing ships to put to sea whenever the weather might permit, whether bound up or down Channel, from whatever point of the compass the wind might blow.

The harbour would accommodate many ships of the line, and numerous smaller vessels, in an anchorage of from six to nine fathoms, in ground of peculiar excellence; great part of the bay being of tough, blue clay, with a slight surface of sand and shells, entirely free from rock and every other impediment to safe anchorage; and as there is here little, if any tide, vessels waiting for a wind might weigh and put to sea, night or day, the moment of a favourable change.

The French and English coasts first approximate to (ships passing up Channel) at the points marked by the caskets on the south, and Portland on the north, between which the Channel narrows to forty-six miles; and the dread of the English coast on the part of the mariner approaching from the westward, through the want of an English harbour, to which he might run in any of the various hazards of navigation, is the cause of frequent shipwreck on the opposite shores.

In the event of the conversion of Portland from an exposed roadstead to a harbour, the mariner would not only avoid this danger, but would approach the English coast with the confidence inspired by the certainty of easy access to a good port, to which he would be conducted by the fine lights exhibited at the points of the Channel abovementioned; at present (however clearly the position of a ship may be ascertained by these lights), they indicate no harbour or place of shelter; the Needles' passage, whatever may be the attention directed to its improvement, must continue to be difficult and dangerous, and is to be attempted during the night, even by the most experinced, in cases of emergency only. By her Majesty's ships of the largest class, this passage will not be used unless urged by the most pressing circumstances.

The advantages to the commercial interest of a harbour at Portland, in regard to ships bound down Channel, would be very great. If viewed in comparison with the Downs or Portsmouth, the saving and facility in every duty and service connected with a final dispatch of a ship for sea would be considerable, the communication with London easy, and an asylum would here be afforded from the storms so frequently fatal to ships upon quitting the Downs and ports to the eastward, as well as to ships bound up Channel, more effectually than in any other port on the south western part of the coast. In regard to ships touching for orders, the superiority of a harbour at Portland over Cowes is manifest.

The great loss and inconvenience which the commercial interests of the country suffer through want of such a harbour, is generally admitted.

Great expectations are formed of the supposed facilities railway communication will give to commerce and manufactures generally; and should those facilities prove equal to the anticipation of the promoters of them, Portland Roads, if converted into a harbour, must necessarily become one of the great points of concentration, situate as it is in the very centre of the English Channel, into which it is so prominently advanced, as to promote both the departure and arrival of vessels in a degree greatly surpassing any other port in the Channel; and this concentration will necessarily require a constantly increasing demand for the produce of the soil.

Beneficial as it has been shown a harbour at Portland would be to the commerce of the English Channel, and as it must be to the agriculture of the adjacent district, yet these, though important, are but partial interests;—it remains to be shown of what vast importance a habour at Portland would be as a national work.

If the present state of the great national work of France at Cherbourg, the selection of its situation by Vauban, the confirmation of his judgment by Buonaparte, the importance that was at first and has ever since its suggestion by Vauban been attached to it by the French nation, are taken into consideration, they deserve deep and serious reflection.

The construction of a harbour at Cherbourg was worthy of the great man who first designed it; and the completion of it in its present form will be a lasting monument to the memory of the extraordinary character who planned, and in part executed, the inner basins, which are now capable of containing upwards of fifty sail of the line.

Cherbourg will be, if not prevented, what Vauban intended it should be in a maritime war with this country,—a point of great annoyance; and any attempt to blockade a considerable fleet in Cherbourg during the winter months must be attended with great difficulty, and no inconsiderable share of danger, beside a certain and enormous expense in wear and tear.

In 1787, Lord Rodney, in a letter addressed to Governor Thicknesse, wrote—"If Cherbourg is once completed, then the British Channel is no more,—it will then be the French Channel;" and Cherbourg is now finished.

Should such circumstances arise as to render probable a war between any or all of the Northern States of Europe and this country, with France as our ally, a harbour at Portland might operate powerfully to prevent actual hostilities, or, at all events, to shorten their continuance, and very sensibly diminish expense. The distance between Portland Roads and Cherbourg is about sixty miles, and with a moderate fleet stationed at each, neither of them exposed to any wear and tear, and a few frigates and steam-vessels to look out, it would be easy, in a great degree, to close the English Channel against the fleets and commerce of any hostile power; a measure that would not fail to lessen the expense of a maritime war upon our own coasts, and greatly increase the security of our commerce, whilst that of the enemy would be impeded or exposed to a circuitous and perilous navigation—circumstances that would necessarily tend to shorten, if not prevent hostilities.

One circumstance remains for observation, which is of more importance than all the others combined, that is, the effect of a harbour at Portland in preserving the lives of our seamen, numbers of whom perish yearly in the English Channel for want of a harbour there. The catastrophes which occasioned the loss of so many valuable lives in the Halswell and Abergavenny East Indiamen, and in the fleet under the command of Admiral Christian, are matters of history; but lives lost in ordinary merchant vessels, without reckoning those lost in foreign vessels, are scarcely noticed. These are, however, considerable, and it is to be hoped, and indeed is confidently believed, that few people exist in her Majesty's dominions who would not

gladly contribute their mite towards the formation of this harbour, if they conceived it would be the means of preserving one human being from an untimely death, especially when it is explained to them that the work may be accomplished for the comparatively small sum of £400,000, which a subscription of fourpence by each inhabitant of the United Kingdom would produce, but which may with more facility be raised on the credit of a duty of one farthing in the pound on the value of the goods and merchandise which pass Portland in merchant vessels.

It is proposed to form the breakwater with the cap stone overlaying the marketable stone of the neighbouring quarries, which is required to be removed to obtain the latter; thus stone, ready prepared, is upon the very site most favourable for its delivery along the line of the works; the quarries are at the top of the hill, about three hundred feet above the sea, so that, by suitable apparatus, it will be brought down and deposited along the line of the breakwater by its own gravity, at all periods of the tide, and in all seasons; thus facilities for the rapid and economical construction of the works are provided, which can be found nowhere else throughout the whole coast. It is proposed to carry out the breakwater two miles and a half in a north-easterly direction, from a point nearly in a line with Fern Hill, on Portland, to another point in Ringstead Bay, on the opposite shore; thus covering an area of four square miles of roadstead, and leaving more than two miles, from the point of the breakwater to the opposite shore, for ships to work out or run into harbour.

The pamphlet which we have so largely quoted abounds in such forcible and convincing arguments in favour of the undertaking, that nothing remains for us to write in further recommendation of it; it is to be hoped, that when the subject is brought before Parliament, that it will be received and treated with the consideration due to its deep and surpassing importance, and that no further delay will take place in completing a work equally called for by sound national policy, the interests of commerce, and considerations of humanity.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL ACADEMY.

At the last election of members, which took place on Saturday, Feb. 10, there were the unusual number of four vacancies, occasioned by the deaths of Sir John Soane, Mr. Constable, Mr. Westall, and Mr. Wm. Daniel. In their places were chosen—Mr. Uwins, Mr. Wyon, Mr. F. Lee, and Mr. Deering, four gentlemen whose election was as honourable to the Royal Academy as to the individuals elected. With the tribute paid to Mr. Wyon, we confess we were particularly gratified, as it was a triumphant answer to the unpatriotic and unjust efforts which have been made to place the merits of this distinguished artist below those of a foreigner, who holds an appointment also in the Royal Mint. Such unfeeling efforts have been nobly disregarded by the best judges in the land, the members of the Royal Academy; who, in choosing Mr. Wyon to be their fellow, have shown that they will not, at the bidding of the Nebuchadnezzars of taste, fall down and worship the brazen image which has been set up.—*Literary Gazette.*

INSTITUTION OF CIVIL ENGINEERS.

THE ANNUAL REPORT.

The Report of the Council on the state of the Institution, and on the proceedings of the past year, contains an account of the origin, constitution, and nature of the Institution, which cannot fail to be read with great interest by all in any way connected with the profession.

It appears that the by-laws have been revised, and several important alterations introduced. Among these a most important one is the rendering the qualifications of the various classes more distinct and explicit, so as to give a more decided character of organization to the Institution, by the incorporation in one class of those who possessed the same qualifications, and by the creation of a new class, for the admission of those who, under the old laws, were included in a class requiring other qualifications. The following extracts from the Annual Report will serve to explain the nature of these changes, and to show the present state of the Institution, which is calculated to contribute so much to the advance of the science of Engineering in every department:—

"The useless and merely nominal distinction betwixt Members and Corresponding Members has been removed; their qualifications being identical, the existence of this nominal distinction and of two classes could not fail of being attended with disadvantages, and has been misunderstood as implying a distinction which was never contemplated.

"These two classes are, by a Special Resolution of the General Meeting of Members, to be incorporated in one class in alphabetical order.

"The qualifications also for admission into the class of Associates were very ill-defined; the whole rising generation of Engineers, or future Members, being included in this class, it was thereby rendered devoid of the distinct character which it ought to possess.

"The creation of a new class, under the term Graduates, will, it is expected, afford the means of that classification which was so much to be desired. In this class will be enrolled those who, either as pupils or assistants to Engineers, are qualifying themselves for the practice of the profession, and are attaining to that degree of experience and knowledge which, in the opinion of at least ten of the general body, with the concurrence of the Council, will entitle them to be enrolled in the class of Members.

"The class of Associates will, it is expected, in future consist of men of experience in pursuits connected with the practice and profession of the Civil Engineer. By the assistance and co-operation of this class, the boundary of knowledge in the infinite variety of subjects which come under the attention of the Engineer, may be extended, and thus that which the talents and resources of one could not attain may be readily attained by the co-operation of many engaged in similar pursuits.

"The existence of a class of Honorary Members, consisting of eminent Engineers of foreign countries, and of others illustrious for their attainments in science, and experience in matters connected with the profession of the Engineer, enables the Institution to connect itself with the names of those of every country who shed a lustre on the profession, or on science in general.

"Thus it is conceived that the Institution has been more adapted to the wants of the present generation, and as it was the wants of society which first called it into existence, so may it reasonably be expected that the continuance of those wants will keep it in a state of progressive improvement and adaptation. The nature of these wants, and the means by which they were in a great measure to be relieved, are, in the address of your Vice-President, Mr. Palmer, to the Meeting which called this Institution into existence, set forth in the following manner:—

"'It is a remarkable fact that, notwithstanding the extensive advancement of science and the general increase of means for an acquaintance with it, that while the principle of systematic education for most of the learned and scientific professions have been and still are actively encouraged, not even an attempt seems to have been made towards the formation of any special source of information or instruction for persons following or intending to follow the important profession of a Civil Engineer, in the practice of which the utmost skill of man is called forth, and which requires not only a knowledge of one leading branch of science, but many—not only of one leading art, but of an indefinite number. For the Engineer, being a mediator betwixt the Philosopher and the working Mechanic, must, like an interpreter betwixt two foreigners, understand the language of both. If, then, we consider for a moment the continued application necessary to familiarize us with any one branch of art or science, surely any argument to enforce a persuasion of the utility of an Institution to facilitate the qualification for a profession in which many branches of both art and science are necessary, must be superfluous.'* By such feelings were your Vice President and first Members† then actuated in forming the Institution; and that these wants, then so urgently felt, have been in some measure supplied, no one can doubt who looks to the continued progress and present state of the Institution. The attainment, in some measure, of the objects proposed, has kept the Institution in a state of progressive improvement up to the present time, and the continued co-operation of all classes cannot fail of producing similar good effects in time to come. For by the opportunities here afforded, the more experienced in the profession may extend their knowledge by communicating with others equally experienced; the rising generation of Engineers may communicate with each other, and receive instruction from the oracles of the profession, and acquire knowledge which conversation alone can give. Here, also, in the records of the Institution, all may become acquainted with the opinions and the practices of the past and the present, and possess opportunities of consulting works and documents to be found in no other place. And when to these advantages are added that of meeting with men of eminence in collateral pursuits, as Associates and Honorary Members, the Council do conceive that the spirit in which the Institution was projected has been well followed out, and its good effects in some measure realized; and that the experienced Engineer, no less than the Student in the profession, possesses opportunities for which, twenty years ago, he would have sought in vain.

"'Much has at times been said respecting the establishment of a School of Engineers, and many comparisons have been drawn betwixt the advantages possessed by this and other countries in this respect; but not for an instant to enter on the great question of the nature of a complete establishment under that name, it may with confidence be asserted, that this Institution is in itself a School of Engineers—a school, not in the sense of the term where knowledge is forced upon the unwilling student, but one where the attentive student possesses remarkable opportunities of self-improvement by study and mutual intercourse.

"'The attention of the Council has been directed to the publication of an Abstract of the papers read, and of the conversations which take place; and such an Abstract, under the title of Minutes of Proceedings, was published soon after the close of last session; and it is the wish of the Council that these should appear at regular and short intervals during the session, while the subjects discussed and alluded to are still fresh in the recollection. On the advantages of this plan it is almost unnecessary to insist, since it has been adopted and approved by many eminent Societies. The public is thus brought immediately into contact with the Institution; the labours and opinions of the author are made known and canvassed while the subject is yet warm with interest, and attention is continually kept alive to the state and progress of each department of knowledge. An authentic and public record also is thus opened, and the credit due to authors for priority of invention and discovery is secured as matter of history. Add to which, there are communications of transient interest, but which could not be deferred to the Publication of the Transactions. It is conceived that the Minutes of Proceedings will furnish a record of papers, remarks, and events, of partial or transient interest, which would be comparatively of little value, unless published at the time; and that the Transactions is the channel through which all more elaborate communications of universal and lasting interest are to be brought before the world.

"'The attention of the Council has also been directed to the publication of another volume of the Transactions; several communications have been selected, and the work is in so forward a state, that the Institution may confidently expect the publication of the second volume before the close of the present session.

"'The Council have also to congratulate the Institution on the completion of the Telford Prize Medals. This beautiful specimen of Mr. Wyon's skill, with the head of Telford on the obverse, and the Menai Bridge on the reverse, was completed last year, and at a public dinner of the Institution, on the 3d of last June, the following medals were presented:—

A Gold Medal to John Timperley, for his MS. account of the Hull Docks.

A Silver Medal to each of the following—

To John Macneill, Member, for his Canal Boat experiments.

* See Address by H. R. Palmer, Jan. 2, 1818; Minutes of Session, 1818.

† Messrs. William Mandsley, Henry R. Palmer, Joshua Field, James Jones, Charles Collinge, and James Ashwell.

To James M. Rendel, Member, for his account of the Lary Bridge.
To Michael A. Borthwick, Associate, for his account of Iron Piling.
To Benedetto Albano, Associate, for his account of the bridge at Turin.
To Peter Barlow, Jun., for his paper on Lock Gates.

"'The communications for which these were adjudged are recorded in the first volume of the Transactions of the Institution.

"'The Council have to regret the loss to the Institution by death of its Member, Arthur Woolf. This distinguished individual was born at Camborne, in Cornwall. He was a millwright, and in that capacity went to London, and was employed in Meux's Brewery. In 1801, he took out a patent for his Two Cylinder Engine, working high pressure steam in a small cylinder, and allowing it to expand in a large one. When he first commenced erecting engines in Cornwall, he induced the proprietors of the foundries to improve their machinery, that a better style of workmanship might be used in the manufacture of steam-engines: and he introduced an improved Hornblower's double beat valve. The work done at the Consolidated Mines, proves him to have been a person of great talents. In October, 1814, the average duty of the engines in Cornwall was 20½ millions; Woolf's engine at Wheal Abraham, however, performed 31 millions; and in December, 1815, 62 millions; and in May, 1816, 67 millions; while the average duty of all the engines reported in Cornwall was 23 millions. In 1820, Mr. Woolf erected engines at the Consolidated Mines having cylinders of 90 inches in diameter, and a stroke of 10 feet—the most powerful that had ever been constructed. In December, 1827, a trial took place with one of Woolf's 90 inch engines, and it performed a duty of 63½ millions—the average duty of 47 engines reported in this year was 32 millions. For some years before his death he received a pension of 100l. a year from the proprietors of the Consolidated Mines. His name is associated with the improvements in the drainage of the Cornish Mines; and whatever share posterity may assign to his individual genius in these improvements, his name is recorded in the page of history among those who have dedicated their talents and the opportunities of a long life to the advancement of practical science.

Abstract of Papers read at the Institution of Civil Engineers, January 9th, 1838; W. Cubitt, Esq., V.P., in the Chair.

On the Duty of the Cornish Engines, by Thomas Wickstead.

Mr. Wickstead having obtained permission to make a trial of an engine upon the Holmbush mines, near Callington, proceeded to ascertain, with great accuracy, the dimensions of the engines and the pumps, and the duty performed.

The diameter of the cylinder was 50 inches, and the whole height of the lifts 535 feet 6 inches, and the diameters of the tie and rose lift pumps were 11 inches, and of the bottom lift 10 inches.

He had 94lbs. (a Cornish bushel) of coals weighed, and took every precaution to ascertain exactly the work done by this quantity. Previous to the trial, the length of the pump-stroke, viz. 5 feet 1 inch, was measured, and the quantity of water delivered per stroke was found to be equal to 285·6lbs. The steam was cut off at one sixth of the stroke, and the temperature of the cylinder in the jacket fully kept up by a free communication with the steam in the boiler. In making the trial, the fire under the boiler was worked down as low as could be without stopping the engine—the pressure of the steam being 10lbs. on the square inch in the boiler. Taking the counter, and the time the engine was started, at the end of 2¼ hours the fire was lowering and the speed of the engine reducing, and it was necessary to have more fuel; the 94lbs. of coal having been consumed, the engine was then stopped, and the counter again taken; it had made 672 strokes, or nearly 5 strokes per minute; the weight of the water raised was 1,918,282lbs., so that the product of the weight and the height through which it was raised, expressing the performance of the engine, was 102,721,323lbs of water raised one foot high with 94lbs. of coal.

This result, however, although it shows the quantity of water raised, does not show the duty of the engine, as no allowance has been made for the unavoidable leakage of the pumps; the fairer method, therefore, of calculating the duty of the engine is from the product of the areas of the pumps, the length of the stroke, and the pressure due to the column of water equal to the height of the lifter; and the duty of the engine in question, calculated upon the above principle, is equal to 117,706,992 lbs. lifted one foot high with 94 lbs. of coal. The author observes, that the engine had not been overhauled, or anything done to it, to prepare for the trial, the particular engine upon which the trial was to be made not having been determined on until the previous day; also, that the boiler and flues had not been cleaned for eleven months. The object being to prove what could be done by an engine worked upon the expansive principle, Mr. Wickstead considered that a trial for two hours would prove the capability of the engine, although most probably the average duty of the engine for twelve months would not be so great as it was for the short time that it was under trial.

Having calculated the effect which could have been produced by the steam-power, provided the engine and pump gear had worked without friction, the difference of the result obtained, and the *duty* of the engine, shows the amount due to the friction, which in the present case was equal to 93,751,710 lbs. raised one foot high, or about 7·75 lbs. pressure per square inch.

It having been observed that the expansive principle would not answer for rotary or double engines, Mr. Wickstead was induced to make some observations upon a double engine, working the stamps for breaking the copper ores at the Turcroft mines. The steam was cut off in the down stroke at two-fifths, and in the up-stroke at one-third, the engine working with a very equal velocity, and upon an average consumption of coal of 30 bushels for the 24 hours. The engine was working a set of stamps—a pump—a crushing machine—and a tumking machine; and the result of the calculation was, that the duty done by the engine was 50,525,072 lbs. lifted one foot high with a bushel or 93 lbs. of coal.

Mr. Wickstead has given two tables: the first is a table, chronologically arranged, exhibiting the gradual improvements of the steam-engine in the course of 66 years; the second, the average duty performed by the engines in Cornwall in 1835 and 1836; and, on the authority of Mr. John Taylor, a comparison of the depths of the Cornish mines at different periods, the water raised, and the coals consumed, showing a saving upon the books of the mines proportionate to the improvements in the working of the engines, stated to have been made during those periods.

The average weight of the coal used in Cornwall is 93 lbs. per bushel, and that the 94 lbs. above mentioned was the Cornish bushel by weight and not by measure. The coals used in Cornwall are nearly all imported from South Wales, and chiefly from the ports of Swansea, Neath, and Llanelly, but are generally of second-rate quality, the better sort being selected for other purposes.

The advantage gained by having steam of a high temperature in the steam jackets of expansive engines is very great. The best engines in Cornwall have the steam jackets supplied from a pipe communicating directly with the boiler. About eight years since, the jacket of an 80-inch steam cylinder at Wheal Towan mine became leaky at the joints, and they were obliged to shut off the steam from the cylinder jacket for a month; that immediately upon so doing they were obliged to pack the piston afresh, as it would not work, which was attributed to the contraction of the cylinder, in consequence of there being less heat, there being no steam in the jacket; that the duty done by the engine this month was but 55 millions, whereas, when the steam was admitted into the jacket, both before and after this period, the duty done was 70 millions.

On Captain Huddart's Improvements in Rope Machinery; by W. Cotton, Esq.

Captain Huddart's attention was directed to the subject of rope-making, in consequence of observing every morning during a voyage that some of the external yarns of the cable were broken, even when it had undergone no very heavy strain.

The cause of the failure of the yarns soon became apparent, in that the strands being all of the same length, an additional strain was of necessity thrown on the external yarns by the process of twisting, when the internal yarns were kinched up.

This defect he proposed to obviate, by giving to each yarn an increased length in proportion to its distance from the centre of the strand, and the angle at which it was laid; for this purpose he invented a machine which he termed a register, which so regulated the length of the yarns as to make them, when twisted into a rope, all bear their due proportion of the strain.

The entirely satisfactory results attending Captain Huddart's experiments rendered him anxious to see his plan of rope-making tried on an extensive scale, and ultimately the partnership of Huddart and Co. was formed, and works at Limehouse were commenced and completed under his superintendence.

For many years the machinery was only employed in the construction of the strand, by which the great increase of strength was obtained, the rope being completed by hand in the usual manner by four gangs of men, three gangs giving what is termed the hard to the strands and keeping up the twist, as the other gang twisted them the other way into a rope; the correctness of this operation depending on all these gangs working with proportionate power and activity, it was frequently found that the strands were not laid in the rope with such accuracy as to allow each of them to bear its proper proportion of strain; and in order to render his plan of rope-making more complete, he designed the large laying machine, which effectually prevented the defects which it was difficult to avoid under the old system.

January 30, 1838. The President in the Chair.

On the relative Advantages and Disadvantages of Four and Six Wheels for Locomotives; by Edward Woods.

The engines at first introduced upon the Liverpool and Manchester Railway were found to be much too slightly constructed for sustaining the shocks and the strains to which their high velocities and the inequalities of the road continually exposed them; so that, after a short period, each individual engine required and underwent a thorough and general repair. These repairs consisted in the substitution of greater strengths and more approved forms of material, together with a mode of connexion of the parts better adapted to resist the repeated and periodical concussions. Thus the outer and inner framings were stayed—wooden wheels replaced with iron ones—crank axles constructed with nearly double the original quantity of materials—pistons, piston-rods, connecting rods, and brasses, were proportionably enlarged, until little remains of the old engine but its boilers and cylinders. The weight of the engine was increased, in consequence of these alterations, from about four and a half tons to nearly ten tons. The effect of this increased weight upon the road could not be otherwise than highly prejudicial, and the result was, that the road originally formed of rails intended to support a moving mass, not exceeding four and a half tons, distributed upon four wheels, was constantly out of repair, the rails being seriously bent, becoming loose, and frequently broken; so that it was found absolutely necessary to relay the whole line with stronger rails, and, as a temporary expedient, to substitute props under the rails between the points of support, and to add a third pair of wheels to the back part of the framing of the engine, behind the fire-box. The advantages obtained from the alterations, and the additional pair of wheels, were almost immediately apparent. The engine lost in a great degree its peculiar rocking motion, as also the unsteadiness arising from lateral undulations. Besides such direct and immediate results, time soon developed further consequences of an important nature, the component parts of the engine remaining for a much longer period securely united and firm, the fastenings of the tubes ceased to leak and give way, and the framings retained more permanently their fixtures, besides the increased safety in the diminished liability of the engine to run off the rails in the event of any accident. The author then considers the often-agitated question of an outside framing to the engines, and proceeds to the consideration of the principal objections against the use of six-wheeled engines, which objections are—1st, The less adhesion to the rails than four-wheeled engines; 2dly, That the axle and weight of the wheels adds to the resistance, and consequently detracts from the available power; and 3dly, That they cannot traverse curves without increased strain and friction. With regard to the first, it is true that the adhesion is less, adhesion being proportioned to the pressure; but the real question to be considered is, whether the ratio between the adhesion and the power of the engine is not sufficient for all practical purposes; and, from the working of the Liverpool and Manchester line, it appears that such is the case. To the second objection, Mr. Woods does not attach much importance, as the additional weight of a pair of wheels, axle, springs, &c., does not exceed 12 cwt., and, therefore, on a liberal estimate, cannot diminish the tractive power of the engine by 1-200th of the whole.

With respect to the third objection, the tendency to strain and friction in passing round curves, and the difficulty of taking the points, is entirely obviated by a very simple expedient. The plummer blocks of the hind wheels are made very light and elastic, so that they will yield readily sideways to an impression. For this purpose, it is found better to use small wheels, say three feet in diameter, that the plates may be long, and the axles at a considerable distance from the framing. Such methods render six-wheeled engines capable of travelling safely curves of eight chains radius, at a speed of 6 to 8 miles per hour; and an instance has occurred of a small curve of even four chains radius being passed at a slow speed.

On Improvements in Water Wheels; by Isaac Dodds.

The result of many experiments, with a view of lessening the bad effects produced

by the back-water upon the water-wheels on any sudden rise or flooding of the stream, had led Mr. Dodds to recommend the adoption of two air-vessels, which may press the sides or water-guides, and serve to carry the wheel; these, when properly ballasted, may raise or lower the wheel and the machinery, according as the water is higher or lower, the race being so adapted that the dam-head may be raised in the same proportion as the back-water.

February 13.

A Description of the French Method of Constructing Flat Roofs with Earthenware Pots; by F. W. Simms.

Mr. Simms having a short time since visited Paris, with a view to examine into the nature and various applications of the asphaltic mastic of Seysel, there extensively employed in the construction of foot-pavements, the covering of roofs, and other purposes, was led, in the course of his inquiries, to examine the construction of the roof of the Manutention des Vivres de la Guerre, Quai de Billy, which is formed of earthenware pots and coated with asphaltic mastic. The roof, which forms a terrace, is nearly flat, having just sufficient inclination to carry off the rain; the voussoirs of the flat arches are formed of cylindrical earthenware pots,* nearly resembling our chimney-pots, with the exception that both ends are closed, and one end being finished off nearly square. The dimensions of the pots vary with the size of the roof to be constructed; those used in the abovenamed roof are about nine inches long, and five inches in diameter. The thrust of the arches is resisted by iron bands and the external walls firmly tied together, and between them and the longitudinal middle wall the arches of the roof are turned with these pots set in mortar. The soffit of the arches being covered with plaster, form, without the intervention of timber, the ceilings of the upper apartments. The extrados of the arches is covered with beton, which is spread so as to give the required inclination for carrying off the water; this surface is afterwards carefully smoothed over with a thin coating of hydraulic mortar, which when dry is itself covered with canvass stretched tight; upon the canvass is poured the asphaltic mastic† in a semifluid state, which setting in a few minutes, forms the finished surface of the terraced roof. Mr. Simms details some facts showing the surprising strength of the roofs thus constructed, their durability, and their easy reparation when injured.

February 20.

Description of Clegg's Dry Gas Meter.

The meter invented by Mr. Clegg for measuring gas may be applied to other useful purposes, as the registering the average pressure of high pressure steam every hour, day, or all the year—the average temperature of heated air, as it leaves the boilers of steam-engines—or registering any variable temperature for any period.

The principle of action of the dry gas meter is the evaporation of spirits of wine, which is well known to vary *directly* as the heat.

To contain the spirits of wine, and to cause a perpetual action as long as the heat is applied, there are two glass globes, about 1 and ¾ inches diameter, ½ an inch apart, joined together by a glass tube of about ⅛ inch bore; these globes are balanced upon an axis, about which they can freely revolve; one globe is nearly filled with spirits of wine, and in the other is a perfect vacuum; these globes are suspended in a frame upon an axis, the gas from the main is then introduced by means of a pipe conducting it to the underside of a gas-burner placed over the globes, which is always lighted when the meter is in action, the gas in its passage is thereby heated, and then conducted by a continuation of the same pipe, terminating by two orifices of nearly equal area, the lower one being rather the largest. These orifices are opposite the centre of each globe; it is obvious, therefore, that the excess of heat would be on the lower globe, and, as the temperature of the burner above the meter varies, so would the excess of heat on the lower globe, and in this state would be useless, as the correctness of the meter depends upon an uniform temperature between the globes, whatever be the temperature of the source from whence it is derived. This uniformity of temperature is accomplished by another portion of gas, much colder than that portion which comes in contact with the burner, but still heated from the same source, blowing upon the upper bulb, this orifice exceeding the difference of area of the two orifices before mentioned, as the temperature of the gas in the lower orifice exceeds the temperature of the colder portion of the gas which is discharged upon the upper globe, so that, if the gas discharged upon the lower globe receives more heat from the burner, the portion of colder gas receives the same quantity of caloric, and counteracts the effect which would otherwise be produced.

It is then ascertained by actual measure what quantity of heated gas will cause the spirits from the lower globe to be driven into the upper one, and this once ascertained, is as much to be depended upon as the vibration of a pendulum.

The globes are so adjusted upon their axis that they remain at rest when one globe is over the other, but so far out of the centre of gravity, that when the spirits from the lower globe is discharged into the upper one, it will by its weight descend, thus causing a vibrating motion, these vibrations being registered by a train of wheel-work as in the water-meters.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At an Ordinary General Meeting, held Monday, 29th January, 1838, Earl de Grey, President, in the chair, the following gentlemen were duly elected:—Charles James Richardson, Esq., as fellow; George B. Webb, Esq., and Charles Henman, Esq., as Associates.

Several donations were announced as having been received since the last Meeting:—A donation of £50 was announced as having been received from G. B. Greenough, Esq., together with a volume of the Transactions of the Geological Society. It was resolved, that G. B. Greenough, Esq., be transferred from the class of Honorary Fellows, and that the best thanks of the Institute be presented to him, for his munificent donation this evening, and that his name be entered on the list of benefactors.

A communication was read from H. E. Goodridge, Fellow, describing the ruins of a Roman villa recently discovered at Newton, near Bath.

Part of an essay, sent in for the Institute medal, on the following subject, was read:—"On the excellences which distinguish the ancient Athenian Architecture, and on the principles of art and science by which they were attained, with regard to design, proportion, light and shade, colour, construction and adaptation to purpose, to situation, and to the materials employed."

Mr. Joyce, of Camberwell, gardener, attended with one of his newly-invented stoves, and explained its general uses and applicability to various purposes.

A portrait of Her Majesty, by A. E. Chalon, Esq., R.A., and now engraving by S. Cousins, Esq., having been lent for exhibition by Mr. Moon, the publisher, was shown to the members and visitors, together with a proof of the engraving.

At a Meeting of the Members, on Monday, the 12th February, 1838; P. F. Robinson, V. P., in the chair, the Earl of Liverpool was duly elected an Honorary Fellow.

The following gentlemen were duly elected as Associates:—Frederick Humphrey, Groves, Esq., Samuel S. T. Carlow, Esq., and Wm. August Buckley, Esq.

Several donations were announced as having been received since the last meeting:—Dr. Moller, of Darmstadt, honorary and corresponding member, presented an engraved outline of the west front of Cologne Cathedral, published by him, with a description, 1837; Owen Jones, Esq., presented casts of two capitals of marble columns from the Alhambra.

The following papers were read:—

The conclusion of the paper on Athenian Architecture, commenced at the last ordinary meeting.

The History of Llanthony Abbey, in illustration of the drawings submitted for the Soane medallion.

The following Report of the Council, on the several essays and drawings sent in for the prize-medals, was read:—

"The Council report, that agreeably to the printed proposals issued, inviting candidates for the prize drawings and essays, that they received four sets of designs for the restoration of monasteries (viz.), two for the Abbey of St. Mary, at York, distinguished by the motto, "*Ut Rosa flo florum sic est Domus ista Domorum*," and "*Quod potui, perfeci*," another for Llanthony Abbey, Monmouthshire, marked, "*Caveat successibus opto quisquis ab eventu facta notanda putat*," and the fourth for Kirkstall Abbey, Yorkshire, with "*Valeat quantum valere potest*," also two essays on the subject of Greek architecture, with the mottos of "Ακαταξεστος," and "*Qualem nequeo monstrare et sentio tantum*;" and one on the polychromy of Gothic architecture, with the device of a triangle inscribed in a circle.

"That, after a careful examination of the drawings and descriptions, the Council have come to the unanimous conclusion, that the design for the restoration of St. Mary's Abbey, York, with the motto "*Ut Rosa &c.*," is the best, and that the author is therefore entitled to the Soane medallion. Also that the design for the restoration of Llanthony Abbey possesses so much merit, that it is very desirable to mark the approbation of the Institute by a premium. And although only the Soane medallion was held out for competition, that a *secondary medal* should be awarded to this production, they accordingly recommended that a Medal be struck from the Institute die, having the wreath on the obverse, and the reverse plain; so as to receive an inscription recording the occasion of its presentation, and that such a medal be given to the author of the restoration of Llanthony Abbey.

"With respect to the essays the Council have unanimously agreed, that the paper distinguished by the motto "Ακαταξεστος," is the best, and that the author is deserving of the Institute medal proposed for that subject.

(Signed) "G. L. Taylor, Chairman."

The recommendation of the Council, as to the adjudication of the several medals, was confirmed.

The letters bearing the mottos of the successful essay and drawings having been opened, the authors appeared to be as follows:—

William W. Pocock, associate, of the essay on Athenian Architecture.

Samuel Sharp, associate, of York, of the restoration of St. Mary's Abbey.

Mr. George Edward Laing, of No. 5, Charlotte-street, Bloomsbury, of the restoration of Llanthony Abbey.

The subjects for the prize medals for the year 1839 were announced—for particulars see Advertisement.

The following being recommended by a Minute of Council of the 8th instant, as proper subjects for the prize medals of the year 1839, Resolved, that the same be the subjects accordingly, viz.:—

"On the peculiar characteristics in design and construction which distinguished Roman from Grecian Architecture, as evinced in their works.

"On the various modes that have been practised in forming artificial foundations of buildings, and their results in different soils and situations, naturally difficult or defective, with a view to deduce the proper principles of construction in these respects.

"On the practical application of the theory of sound in the construction of edifices, by which the principles may be ascertained for building theatres, churches, halls, and other places for public meetings, in the manner most favourable for the transmission of sound.

"The restoration of some ancient baronial castle in England, Scotland, or Ireland, such as Conway, Caernarvon, Bamborough, Corfe, or Warkworth Castles, with the several courts, halls, chapels, keeps, and dependencies, to be drawn from actual measurement, distinguishing in a marked manner the parts existing from those restored to complete the combination, accompanied by a description."

ROYAL INSTITUTION OF BRITISH ARCHITECTS.

To the Right Honourable the Lords Commissioners of Her Majesty's Treasury.

The humble Memorial of the President, Council, and other Members of incorporated Institute of British Architects,

Sheweth—That the Institute has been incorporated under a charter granted by his late Majesty King William the Fourth, for the purpose of facilitating

* This method of forming arches has been adopted in England for many years; several of the roofs at the Bank are thus constructed.—*Editor C. E. & A. Journ.*

† We gave some account of the asphaltic mastic or cement in the Journal, No. 4, page 90; a full account of its various applications is given in a small pamphlet by Mr. Simms, entitled "Practical Observations on the Asphaltic Mastic, or Cement of Seyssel."—Editor.

the acquirement and diffusion of architectural knowledge, for the promotion of the different branches of science connected therewith, and for the establishing a uniformity and respectability of practice in the members of the profession; thus embracing many objects, which may justly be deemed of very great importance to a nation, considering the influence which public monuments are calculated to exercise upon the character of the people.

That her present Majesty has graciously been pleased to become the patroness of the Institute.

That your Memorialists have already published the first volume of their Transactions, which has been favourably received, so as to render necessary the publication of a second edition. The most celebrated architects of foreign countries have been associated as honorary and corresponding members, by which means an extensive correspondence has been established with various parts of the globe.

That since the original formation of this Institute a considerable collection of books, casts, models, prints, and drawings has been made, to such an extent that the members are not able to provide sufficient accommodation for the reception of the collection, and holding its meetings in a convenient and respectable part of the metropolis, without incurring a rent, to which the funds are inadequate.

That the Institute is, as your Memorialists firmly believe, well calculated to exercise the most beneficial influence upon the practice of civil architecture in this country; which consideration, taken in connexion with the progress that has been made under the auspices of his late Majesty and our present most gracious Sovereign, in placing the Society upon a permanent footing, leads its members to entertain a confident hope that the Government of the country will extend its fostering protection and countenance, as in the case of other societies having objects certainly not more important to the community, and be induced to afford the Institute of British Architects apartments for holding its meetings, and depositing the collection which it already possesses, and which it may acquire.

That your Memorialists trust your Lordships will be pleased to allot apartments in Somerset House, or in some other public building, for the purposes aforesaid, as such accommodation would very greatly tend to render this Institute permanently and more extensively useful, and no less honourable to the nation as a public institution.

Your Memorialists therefore humbly pray your Lordships to take the above statement into consideration, and to afford to this Society the important assistance above referred to.

And they will ever pray, &c.

Signed by HIS LORDSHIP, THE PRESIDENT, AND THE OTHER MEMBERS OF THE COUNCIL, AND WITH THE CORPORATE SEAL ATTACHED.

Treasury Chambers, Feb. 13, 1838.

My Lord and Gentlemen—Having laid before the Lords Commissioners of Her Majesty's Treasury your Memorial, in which you pray that apartments may be provided for the use of the Institute of British Architects at Somerset House, or elsewhere, I am commanded by their Lordships to acquaint you in reply, that with every disposition to forward the useful objects which the Society seeks to attain, my Lords have it not in their power to provide apartments for the use of the Society. I have the honour to be, my Lord and Gentlemen, your obedient servant,

To the President, Council, and Members of the Institute of British Architects. A. GROSVENOR.

MEETINGS OF SCIENTIFIC SOCIETIES.

Institution of Civil Engineers, 1, Cannon-row, Westminster, every Tuesday evening, at 8 o'clock.

Royal Institute of British Architects, 16, Grosvenor-street, Grosvenor-square, Monday Evening, at 8 o'clock, February 12th and 26th. Lectures, February 8, 12, 15, 22, and 26th, at 8 o'clock.

Architectural Society, 35, Lincoln's-inn-fields, Tuesday, March 13th, at 8 o'clock.

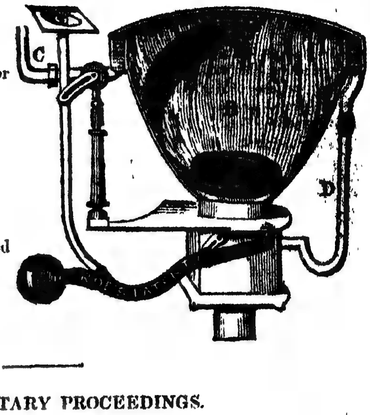
Society of Arts, Adelphi, every Wednesday, at 8 o'clock. Illustration Tuesday, March 13th.

ARCHITECTURAL SOCIETY.

Tuesday, January 30, 1838.—The usual meeting was held, J. Wooley, Esq., in the chair. The balloting for the students' drawings then took place; after which the following paper, by William Wallen, Jun., Esq., member, was read:—"On Prejudice as to style in Architecture." Mr. Fox exhibited several specimens of coloured and embossed glass, which excited much interest from their excellence and cheapness; they are deserving of the attention of the profession. The subjects for the members' and students' sketches were then given out, and the meeting adjourned.

Tuesday, February 13, 1838.—The usual monthly meeting was held, W. B. Clark, Esq., the President, in the chair. A paper was read by John Blyth, Esq., a member, on "The Necessity of a National School of Architecture."

Mr. Roe exhibited his patent water-closet apparatus, and explained the improvement and superiority over those now in use. The following are its advantages:—It is not necessary to have the complicated apparatus which is attached to the common closet, viz., water-box, valves, lever, cranks, or wires, and a separate pipe to each closet, and frequently a cistern also; Mr. Roe's closet, no matter how many there are in a building, can be supplied from one cistern (if it be above the highest closet), and one main pipe, with branches to the several closets. The principal improvement seems to be, that instead of the common stool-cock, the patentee has invented a conical valve cock, that is opened by lifting a handle (in the seat), as in the present closet. There is also an improvement in the basin: round the rim is a small chamber, with an aperture all round the pan, from which, in addition to the fan at the back, the water flows immediately the valve cock is opened, and completely cleanses the pan, as shown in the annexed figure.



A Recess reserving the after supply for bottom of basin.

B Basin with recess overflowing.

C Supply-pipe from cistern.

D Overflow-pipe. This pipe is charged every time the closet is used.

PARLIAMENTARY PROCEEDINGS.

FEB. 5.—*Thomas Parkin.*—Petition of Thomas Parkin, complaining of the infringement of his patent for improving the construction of railways, by the London and Croydon Railway Company; ordered to lie on the table.

Farringdon Street, London.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Soane's Museum.—Statement of the Funds of the Museum on 5th January, 1838, presented (by act); to lie on the table.

Public Monuments.—Return presented, of Monuments erected in Westminster Abbey and St. Paul's at the public expense, from 1750 (ordered 21st December); to lie on the table.

Gloucester Water-works.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Belfast Water-works (No. 2).—Petition for Bill referred to the Select Committee on Petitions for Private Bills.

FEB. 6.—*London and Greenwich Railway.*—Petition for Bill reported, and Bill ordered to be brought in by Mr. Wolverley Attwood and Mr. Barnard.

Manchester, Bolton, and Bury Canal and Railway.—Petition for Bill reported, and Bill ordered to be brought in by Mr. Wilson Patten and Lord Viscount Sandon.

Newcastle-upon-Tyne and Carlisle Railway.—Petition for Bill reported, and Bill ordered to be brought in by Mr. Ord and Mr. Philip Howard.

Gravesend Pier.—Petition for Bill reported, and Bill ordered to be brought in by Sir M. Wood and Sir W. Geary.

Tenby Improvement.—Petition for Bill reported, and Bill ordered to be brought in by Sir John Owen and Mr. Owen.

FEB. 7.—*Gravesend Pier Bill.*—"For preventing the partial collection of certain tolls and rates granted for the erection and support of Gravesend Quay and Pier," presented; read first time; to be read a second time.

Festiniog Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Brandling Junction Railway.—Petition for Bill reported, and Bill ordered to be brought in by Mr. Ingham and Mr. Bell.

London and Greenwich Railway Bill.—"For extending the time for completing the London and Greenwich Railway, and for amending the Act relating thereto," presented; read first time; to be read a second time.

Metropolis Cemetery.—Petition for Bill reported; report ordered to lie on the table.

Anti-Dry-Rot Company.—Petition for Bill reported; report ordered to lie on the table.

FEB. 8.—*Midland Counties (Mountsorrel) Railway.*—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Ramsgate Improvement.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Petitions for Private Bills Committee.—Power to send for persons, papers, and records.

FEB. 9.—*Newcastle-upon-Tyne and Carlisle Railway Bill.*—"To authorize the Newcastle-upon-Tyne and Carlisle Railway Company to raise an additional sum of money for the purposes of their undertaking," presented; read first time; to be read second time.

Edinburgh and Glasgow Railway.—Petition in favour of the application; ordered to lie on the table.

Southampton Pier.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Necropolis Cemetery.—Report [7th February] read; Bill ordered to be brought in by Mr. Phillpotts and Sir Matthew Wood.

Fishguard Harbour.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Eastern Counties Railway.—Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

London and Croydon Railway (No. 1).—Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

Tenby Improvement Bill.—"For the Improvement of the Borough of Tenby, in the County of Pembroke, and for regulating and maintaining the Harbour and Pier belonging thereto; presented and read first time.

Montgomeryshire Western Branch Canal.—Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

FEB. 12.—*Necropolis Cemetery Bill.*—"For incorporating a Company, to be called the 'Necropolis Cemetery Company;' and for enabling such Company to establish

a Cemetery for Interment of the Dead in the vicinity of the metropolis;" presented; read first time; ordered to be read a second time.

Grand Junction Railway.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Aberbrothwick Harbour.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Bristol and Exeter Railway.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Swansea Harbour.—Petition for Bill; referred to Select Committee.

Edinburgh and Glasgow Railway.—Petition of the Provost, Magistrates, and Town-Council of Bathgate, against the application; referred to the Select Committee on Petitions for Private Bills.

Cheltenham and Great Western Union Railway.—Petition for Bill reported; report referred to the Select Committee on Standing Orders.

Soane's Museum.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Metropolis Improvements.—Order [21st December] for appointing a Select Committee read, and discharged. Select Committee appointed, "to take into their consideration the several Plans for the Improvement of the Metropolis, concerning which a Report was made to this House by a Committee in the year 1836, together with any other Plans for the same object, which they may deem deserving of consideration, and to report their opinion as to the expediency of adopting any of the said improvements, and also as to the best means of carrying the same into effect:—Sir Matthew Wood, Mr Chancellor of the Exchequer, Sir Robert Peel, Lord Viscount Lowther, Mr. Herries, Admiral Codrington, Sir Robert Harry Inglis, Mr. Shaw Lefevre, Mr. Wakley, Colonel Evans, Mr. Clay, Mr George Palmer, Mr. Pendarves, Mr. Barnard, Mr. Hall.—Power to send for persons, papers, and records; Five to be the quorum.—Report from Select Committee on Metropolis Improvements [2d August, 1836] referred.

FEB. 13.—*Bury* (Lancaster) *Water-works.*—Petition for Bill; referred to Select Committee.

Edinburgh and Glasgow Railway.—Petition for Bill reported, Report referred to Select Committee on Standing Orders

Gairnkirk and Glasgow Railway.—Petition for Bill; referred to Select Committee.

Newquay (Cornwall) *Harbour.*—Petition for Bill, referred to Select Committee

Newtyle and Coupar Angus Railway.—Petition for Bill, referred to Select Committee.

Oldham Gas Light and Water works.—Petition for Bill; referred to Select Committee.

West India Docks.—Petition for Bill; referred to Select Committee.

Ribble Navigation.—Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

Turton and Entwistle Reservoir.—Petition for Bill, referred to the Select Committee on Petitions for Private Bills.

Standing Orders Committee.—Resolution reported.—"That, in the case of the Leominster Improvement Petition, the parties be permitted to proceed with their Bill, on inserting the Notice in three successive *London Gazettes*; and that the Committee on the Bill do examine, in the first place, how far such Order has been complied with, and do report the same to the House on the Report of the Bill" Resolution agreed to.

Moy River Navigation.—Petition for Bill, referred to the Select Committee on Petitions for Private Bills.

FEB. 14.—*Gravesend Cemetery.*—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Brandling Junction Railway Bill.—"To enable the Brandling Junction Railway Company to raise an additional sum of money," presented, read first time, to be read second time.

Isle of Thanet Cemetery Bill.—Petition for Bill, referred to Select Committee.

Southampton Docks.—Petition for Bill; referred to Select Committee.

Newcastle-upon-Tyne and North Shields Railway Extension.—Petition for Bill, referred to Select Committee.

Blackburn Gas.—Petition for Bill; referred to Select Committee.

FEB. 15.—*Edinburgh and Glasgow Railway.*—Seventeen Petitions in favour of the application; ordered to lie on the table.

London and Brighton Railway Act.—Petition of James Mills, praying for the repeal of the said Act, and that the House will allow the subscribers to Mills's line of Railway, who have deposited plans, &c., in conformity with the Standing Orders, to proceed with their Bill during the present Session; ordered to lie on the table.

Severn Navigation.—Petition for Bill, referred to Select Committee on Petitions for Private Bills.

Taw Vale Railway and Dock.—Petition for Bill, referred to Select Committee on Petitions for Private Bills.

Paington Harbour Bill.—Reported, and re-committed to former Committee; leave to sit and proceed, and to report on Monday next.

St. Helen's and Runcorn Gap Railway.—Petition for Bill, referred to Select Committee on Petitions for Private Bills.

Bolton and Preston Railway.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

Grand Junction Railway.—Petition for Bill; referred to Select Committee on Petitions for Private Bills.

FEB. 16.—*Tyne Dock.*—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Sudbury Water-works and Improvement.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Severn Navigation (No. 2).—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Hartlepool Dock and Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Portland Cemetery.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

West Durham Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Ardrossan Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Metropolitan Suspension Bridge.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

Thames Improvement Company and Drainage Manure Association Bill.—"To incorporate a Company by the name of the Thames Improvement Company and Drainage Manure Association," presented and read first time; to be read second time.

Birmingham, Bristol, and Thames Junction Railway.—Petition for Bill; referred to the Select Committee on Petitions for Private Bills.

FEB. 19.—*Paignton Harbour (re-committed) Bill.*—Reported; to lie on the table.

Milton next Sittingbourne Improvement Bill.—Read third time, and passed.

Manchester, Bolton, and Bury Canal and Railway Bill.—"For enabling the Company of Proprietors of the Manchester, Bolton, and Bury Canal Navigation and Railway to raise more money; and for amending the powers and provisions of the several Acts relating thereto," presented and read first time; to be read second time.

Standing Orders Committee.—Resolutions reported and agreed to:—"That in the case of the Montgomeryshire Western Branch Canal Petition, the parties be permitted to proceed with their Bill."—"That, in the case of the Eastern Counties Railway Petition, the parties be permitted to proceed with their Bill."—"That, in the case of the Cheltenham and Great Western Railway Petition, the Standing Orders be dispensed with, except in the deviation exceeding one mile proposed to be made in the tunnel at Sapperton, and that they be dispensed with in this case also, on the parties producing to the Committee on the Bill the consent of the owners or reputed owners, lessees or reputed lessees and occupiers of the land under which the tunnel is to pass, and that the Committee on the Bill do report to the House how far such Order has been complied with, on the Report of the Bill."—"That in the case of the London and Croydon Railway Petition, the parties be permitted to proceed with their Bill, on proving to the Committee thereon, that the sum of 800l., being one-tenth part of the amount subscribed, now deposited under seal in the banking-house of Messrs. Jones, Lloyd, and Co., Lothbury, remains so deposited; and that the Committee on the Bill do report to the House how far such Order has been complied with, on the Report of the Bill."—"That, in the case of the Edinburgh and Glasgow Railway Petition, the parties be permitted to proceed with their Bill, on proving to the Committee thereon that a deposit of ten per cent. on the amount subscribed is made as required by the Standing Orders; and that the Committee on the Bill do report to the House how far such Order has been complied with, on the Report of the Bill."

Cheltenham and Great Western Union Railway.—Report (this day) from Select Committee on Standing Orders, read; Bill ordered to be brought.

FEB. 20.—*Glasgow Water-works.*—Petition for Bill reported, and Bill ordered to be brought in

Cheltenham and Great Western Union Railway Bill.—"To alter the Line of the Cheltenham and Great Western Union Railway, and to amend the Act relating thereto," presented, and read first time, to read second time.

London and Croydon Railway.—Report (19th February) from Select Committee on Standing Orders read; Bill ordered to be brought in.

London and Greenwich Railway Bill.—Read second time, and committed.

FEB. 22.—*Festiniog Railway.*—Petition for Bill reported; Report to lie on the table.

Farringdon Street (London). Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

Midland Counties (Mountsorrel) Railway.—Petition for Bill reported; Report referred to the Select Committee on Standing Orders.

Southampton Pier. Petition for Bill reported, and Bill ordered to be brought in.

FEBRUARY 23.—*Eastern Counties Railway.* Report [19th February] from Select Committee on Petitions for Private Bills read; Bill ordered to be brought in.

London and Croydon Railway (No 1) *Bill.*—"to enable 'The London and Croydon Railway Company' to enlarge their station in the parish of St. Olave, in the borough of Southwark in the county of Surrey, and to amend the Acts relating to said Railway and Station, presented and read first time, to be read second time.

Anti Dry Rot Company.—Report [7th February] from Select Committee on Petitions for Private Bills read, Bill ordered to be brought in.

London and Greenwich Railway Bill.—Petition for additional provision; referred to the Select Committee on Petitions for Private Bills.

LAW PROCEEDINGS.

Middlesex Sittings, at Nisi Prius, before the Lord Chief Justice of the Common Pleas and a Special Jury.

INFRINGEMENT OF A PATENT.—JONES *v.* HEATON AND OTHERS.

This was an action for the infringement of a patent obtained by the plaintiff, who was a machine manufacturer at Birmingham, *for certain improvements in the machinery for moulding bricks, tiles, and other articles made of brick-earth*, to which there were several pleas. First, that the plaintiff was not the true and first inventor; secondly, that the specification did not sufficiently describe the manner in which the invention was to be carried into effect; and thirdly, that the alleged invention was not, before the granting of the patent, perfect and complete.

Mr. Sergeant Wild and Mr. Watson appeared for the plaintiff, and Mr. Sergeant Talfourd and two other learned gentlemen for the defendants.

The cause occupied the court two days, and it appeared in evidence that the plaintiff obtained his patent in August, 1835, and that on the 10th of February following, the specification was enrolled. That specification pointed out the principal features of novelty in the machine to be an inclined plane, at the top of which the bricks were delivered, and pistons to force the bricks up the track of that inclined plane; and the defendants, to support the case—which was, that they had invented and used a machine on that principle previously to the granting the patent—called witnesses to prove, that one of the defendants, in a consultation with his son-in-law, held in March, 1835, had described and sketched such a machine from his own invention; that in the following June he had exhibited a model of it to another son-in-law; that he had, in June or July, employed some persons in the manufacture of the machine, which was now used by the defendants and complained of by the plaintiff; that in January, 1836, it was used for the purpose of experiment, but only to a small extent; that at the end of January or beginning of February (no more precise date being given) the Excise-office of Birmingham saw the machine in operation, and a small number of bricks made by it, but that it

was not brought into regular work until the month of April, 1836. That was the substance of the evidence for defendants on the first issue; on the other issues, scientific men were called to speak to the sufficiency of the specification, but upon that, the usual difference of opinion existed—Mr. Bramah, on the one side, thinking it amply sufficient, and Mr. Farey, on the other, regarding it as wholly insufficient; the one gentleman considering the plaintiff's invention very valuable, the other deeming it almost utterly useless. It appeared further, that the specification embraced two machines, the one square and the other circular; and with a view to show that subsequent to the date of the patent the plaintiff had altered his notion of the machine, and substituted the circular one for the square, defendants endeavoured to prove that the articles used at first were applicable only to the square one, which had not been used by defendants, and was not, therefore, in dispute; but it was urged on the part of the plaintiff, that the two machines were described in two different and distinct parts of the specification, and that the plaintiff was fully entitled to maintain both.

The Lord Chief Justice, in summing up the case, told the Jury, that in order to establish the point that the plaintiff was not the first and true inventor, it was necessary that they should be satisfied that there had been a public user of the machine previous to the date of the patent.

Verdict for the plaintiff on all three issues.

RATING OF RAILWAYS TO THE POOR RATE.

An important appeal was tried at the last Kirkdale Sessions. The Grand Junction Railway was rated in the township of Newton at £1,800 per mile per annum. It was admitted that the traffic on that particular part of the line was greater than on any other. The parish contended, that the gross annual value was £1,659 per mile in the township, and the value to let in the same £1,231, deducting 20 per cent. for tenant's profits, and for maintaining the railway; and £70 for parochial charges. It was proved that the gross toll on the Warrington and Newton line had been £640 per mile, the cost of repairs £57, and the parish proposed to double that allowance on the Grand Junction. For the appellants it was contended, that from the gross produce ought to be deducted the general expense of maintaining the railway, police, engineers, &c., reducing the "full annual value to let," on their showing, to £827 per mile. The magistrates had a long consultation, and, we understand, a protracted discussion as to the different facts. At a late hour they gave their decision, allowing £20 per cent. for profits of a supposed lessee; £300 (instead of £150) per mile, for maintenance of way, &c.; and the £70 for parochial charges. The result of the appeal thus being in figures, that the appellants will have to pay £14 17s. instead of £27 7s. 6d., the amount of the rate at 4d. in the pound, on two-thirds "the net annual value to let"—the rates on all other property in this township being only on two-thirds.

COMPENSATION CAUSES.—HULL CORPORATION v. THE RAILWAY COMPANY.

The case which was brought at the instance of the Corporation of Hull against the Hull and Selby Railway Company, for the purpose of ascertaining the value of the land belonging to the corporation required for the purposes of the Railway, was tried in the Court Room, at the Mansion House, on Saturday, the 3rd ult.; Mr. Matthew Davenport Hill and Mr. Reynolds appeared as counsel for the plaintiffs, and Mr. Baines and Mr. Hildyard for the defendants. A number of witnesses were examined as to the value of the lands in dispute; and after a long and tedious investigation, which occupied the whole of the day, the jury assessed the damage due to the corporation for the loss of the land at £3,675 17s. The case was heard before Mr. Thorney, the coroner's assessor. The result of the trial at Beverley, which lasted two days, between the trustee of the late Mr. A. Atkinson, of Dairycoates, and the Hull and Selby Railway Company, is as follows:—

Demand made on the company	£6,574	0	0
Offer made by the company	1,850	0	0
Verdict of the jury	1,810	0	0

The trial between Mr. Spicer, of Hessle, and the Company, came on also at Beverley, and occupied the whole of Thursday, the 8th ult., ending in the following result:—

Demand made on the company	£2,500	0	0
Offer made by the company	1,073	15	0
Verdict of the jury	1,070	0	0

The verdicts being below the offers, half the costs of the Company will have to be paid by the claimants.

THE LEEDS AND MANCHESTER RAILWAY v. MR. HENRY TAYLOR.

An inquiry to assess damages under the Leeds and Manchester Railway Act, took place before a jury specially summoned for the purpose, on Friday, 2nd ult., at the Coach and Horses, St. George's-road. The party for taking whose land damages were assessed, was Mr. Henry Taylor, of Pontefract. The land required is situated in the vicinity of St. George's Church. No offer had been made on the part of the company. Evidence was adduced on the part of Mr. Taylor, to prove that the property might be rendered very valuable for wharfing purposes, as it was near a branch of the Rochdale canal, which might, without much difficulty, be brought into Mr. Taylor's land, and several valuers were called to prove the value of the land, the average of whose valuation was about 1s. per yard, at twenty years' purchase. For wharfing purposes the land was valued at £44,000., and for building upon, at £24,000. The valuers called on behalf of the Railway, valued the land at £15,000, or thereabouts, and the jury, after being charged by the assessor, gave £17,000. The costs on both sides to be paid by the Railway Company, and the price awarded averages 4½d. per yard, at twenty years' purchase on the whole quantity of land taken. The counsel for the Railway Company were Mr. Creswell, Mr. Brandt, and Mr. Wilkins; and for Mr. Taylor, Sir F. Pollock, Mr. Foster, and Mr. Duck. The case occupied the whole of the day.—From the *Manchester Courier* of Saturday, Feb. 7th.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 25TH JANUARY, AND THE 24TH FEBRUARY, 1838.

WILLIAM BATE, of Werrington, Northampton, Esq., for "Certain Improvements in obtaining and regulating Power."—27th January; 6 months.

MATTHEW HEATH, of Furnival's Inn, London, Esq., for "Improvements in Engines to be worked by Steam and other Fluids, being a communication from a foreigner residing abroad."—27th January; 6 months.

CHARLES FLUDE, of Long Lane, Bermondsey, Surrey, Manufacturing Chemist, for his "Invention of Improvements in applying Heat to the manufacture of Alkalies and Salts, and for smelting and otherwise working Ores, Metals, and Earths."—30th January; 6 months.

CHARLES PHILLIPS, of Chipping Norton, Oxford, Surgeon, for "Improvements in Apparatus or Machinery for punching, bending, cutting, and joining Metal, and for holding or screwing Metal to be punched, bent, cut, or otherwise operated on; parts of which Machinery are adapted to perform some of these operations on other Materials."—30th January; 6 months.

JOHN BARNETT HUMPHREYS, of Southampton, Civil Engineer, for his "Invention of Improvements in Marine and other Steam Engines."—30th January; 6 months.

DAVID WILKINSON SHARP, of Bingley, York, Worsted Spinner, for "Certain Improvements in Machinery or Apparatus for Warping worsted, linen, cotton, silk, or woollen Yarns."—30th January; 6 months.

GEORGE RYDER PEPPERCORNE, of Vauxhall, Surrey, Gentleman, for an "Improved Machinery to be employed for Locomotion on Railroads and other Roads, which is also applicable to other Engines for exerting Power."—31st January; 6 months.

WILLIAM HOLME HEGINBOTHAM, of Stockport, Chester, Gentleman, for "Certain Improvements in the construction of Gas Retorts."—31st January; 6 months.

GEORGE CHARLTON, of Wapping, Middlesex, Master Mariner, for "Improvements in Anchors, Capstans, Windlasses, and means of mooring and riding Ships at Anchor."—8th February; 6 months.

JOHN MELVILLE, of Upper Harley Street, Middlesex, Gentleman, for "Improvements in the generation of Steam, and on the application of Steam to Navigation."—8th February; 6 months.

JEROME DEVILLE, of Crutched Friars, London, Coach-builder, for "Certain Improvements in Railroads, and in the Carriages to be used thereon."—8th February; 6 months.

ROBERT ESSEX, of St. Mary, Islington, Middlesex, Silversmith, for "Certain Improvements in the construction of Paddle Wheels, and in the Paddle Boxes or Cases of Steam Vessels."—8th February; 6 months.

JAMES DUTTON, of Wotton-under-edge, Gloucester, Clothier, for "Certain Improvements in the manufacture of woollen Cloth, which Improvements apply both to weaving and dressing of woollen Cloth."—8th February; 6 months.

WILLIAM FARQUHAR, of George Street, Tower Hill, London, Chronometer-maker, for "Improvements in generating Steam for Steam Engines."—13th February; 6 months.

JOHANN GOTTLOBB SEYRIG, of Paris, in the kingdom of France, Mechanician, now of Old Compton Street, Soho, Middlesex, for "Certain Improvements in expressing or extracting Liquids or Moisture from woollen, cotton, and other stuffs and substances, either in a manufactured or unmanufactured state."—16th February; 6 months.

JOSEPH ERICSSON, of Berkeley Street, Connaught Square, Middlesex, Civil Engineer, for an "Improved Steam Engine."—16th February; 6 months.

JOHN JACKSON, of Kersley, Lancaster, Joiner and Cabinet-maker, for "Certain Improvements in sawing, planing, tongueing, and grooving, and otherwise preparing or constructing Window Sashes, Door and other Frames, Cornices, Mouldings, and various other Fittings or ornamental Wood Work; and in Machinery, Tools, or Apparatus to be used in the same."—16th February; 6 months.

EUGENE RICHARD LADISLAS DE BREZA, late of Paris, but now of St. Martin's street, Leicester-square, Gent., for a "Chemical combination or compound for rendering cloth, wood, paper, and other substances indestructible by fire, and also preserving them from the ravages of insects."—Feb. 20; 6 months.

JEREMIAH GRIME, of Bury, Lancaster, engraver, for "Certain Improvements in manufacturing wheels which are applicable to locomotive engines, tenders, and carriages, and to running wheels for other useful purposes, and also in the apparatus for constructing the same."—Feb. 21; 6 months.

JOHN CLAY, of Cottingham, near Hull, York, merchant, SAMUEL WALKER, of Millshaw, near Leeds, cloth manufacturer, and FREDERICK ROSENBERG, of Hull, for "Certain Improvements in machinery or apparatus for shearing or cropping, and dressing and finishing woollen and other cloths."—Feb. 22; 6 months.

EDWARD STOLLE, of Arundel-street, Strand, Esq., for "Improvements in making sugar from sugar cane, and in refining sugar."—Feb. 21; 6 months.

MOSES POOLE, of Lincoln's-inn, Middlesex, Gent., for "Improvements in preserving wine and other fermented liquids in bottles, being a communication from a foreigner residing abroad."—Feb. 24; 6 months.

JOHN HOULSTON, of Bradford, York, printer, for "Improvements in apparatus for stopping or retarding carriages."—Feb. 24; 6 months.

AMBROISE ADOR, of Leicester-square, Middlesex, chemist, for "Certain Improvements on lamps or apparatus for producing or affording light."—Feb. 24; 6 months.

JOHN THOMAS BETTS, of Smithfield Bars, London, Rectifier, for "Improvements in the manufacture of Gin, which he intends to denominate Betts' Patent Gin, or Betts' Patent Stomachic Gin, partly communicated by a foreigner resident abroad."—24th February; 6 months.

MICHAEL WHEELWRIGHT IVISON, Silk Spinner, Hailes Street, Edinburgh, for "An Improved Method of Consuming Smoke in Furnaces and other places where fire is used, and for Economising Fuel; and also for applying Air, heated or cold, to Blasting or Smelting."—24th February; 6 months.

STEAM NAVIGATION.

New Steam Shipping Company.—We understand the Marquis of Breadalbane, with that public spirit so peculiarly characteristic of his lordship, has entered warmly into the proposal for establishing a direct communication between Perth and London by steam, and has subscribed for shares in the concern to a large extent. Mr. Kinnaird, the member for the city, is also giving the project his strenuous support, and has taken a considerable number of shares of the stock.—*Perth Courier.*

We understand, that at a meeting of the partners of the Aberdeen and Hull Shipping Company, it was unanimously resolved, in order to meet the increasing trade betwixt this port and Hull, to introduce a powerful steam-vessel into their trade. We have no doubt the additional accommodation thus afforded the public will be duly appreciated, and that the company will have no cause to regret the resolution they have come to.

Steam Navigation.—A parliamentary paper, just published, show that steam navigation is making progress in all parts of Europe. It consists of returns from the British Consuls stationed at the principal trading towns, dated generally in the autumn of 1836. From this we find that five steamers, from 50 to 200 tons each, are employed in the intercourse between the ports of Denmark. In the ports of Sweden twenty-seven, but only from 15 to 100 tons burden; the speed from five to eight miles an hour. In the ports of Russia twenty-six, speed from six to ten miles. In those of Prussia only three. Rostock has one; Lubec two; Hamburgh three. Amsterdam has three. Rotterdam has twenty-six, of which thirteen ply on the Rhine between Rotterdam and Cologne; they are from 75 to 100 tons burden; the Antwerp and Ghent have three. In France—Havre has seventeen, of which two are sea-boats, and fifteen ply on the Seine; Brest has one steam-boat; Nantes has twenty-one, which chiefly ply on the Loire, some to Angers, others to Orleans, 250 miles from the sea; several of them draw only thirteen or fifteen inches water. This river is the chief seat of steam-navigation in France. Rochelle has two, and Bordeaux sixteen; Marseilles and Toulon have twelve. France had in all sixty-nine steam-boats in 1836. Spain and Portugal have each four steam-boats. Sardinia has five, Tuscany one, Naples eight, and Austria six.

Steam Navigation to India by the Cape of Good Hope.—We have learnt that a body of influential gentlemen, under the chairmanship of Captain Sir John Ross, have formed a company for building steam-vessels of twelve hundred tons, which can make the voyage to India by the Cape, carrying between six and seven hundred tons of merchandise, in the almost incredible short space of fifty-two days, with only one stoppage for fuel; and that the apparatus (a newly-invented boiler, by Mr. Collier) has been tried in a voyage made by Sir John, the result of which more than justified the expectations held out by the inventor.—*Morning Post.*

Steam between the Tyne and the Tay.—The Shields and Newcastle General Steam Navigation Company, to render complete and satisfactory the accommodation of their beautiful steam-vessels, which they have run so successfully on the Leith and Hull stations, have purchased the splendid steamer Northern Yacht, so much admired on the Scotch coast, as the most able and fast-sailing vessel in the kingdom. Early in the spring, she will commence running regularly between the Tyne and Dundee.—*Sunderland Herald.*

Two iron steamers are at present building to convey passengers from the pier at Hungerford-market, in the spring, down the river. They are to be on a large scale, and fire-proof.

PROGRESS OF RAILWAYS.

Eastern Counties Railway.—The contract for the iron bridge over the Regent's Canal, on this line, for which tenders were lately advertised, has been obtained by Messrs. B. and N. Sherwood, of Lambeth—sum 2,478*l.* The iron work is, we understand, to be supplied by the Horsley Company. The successful competitors for the supply of the rails (parallel) and chairs, for the portion of the line between Mile End and Ilford, are Messrs. Joseph and Crawshay Bailey, of the Nanty-glo Iron-works, and Messrs. Guest, Lewis, and Co., of the Dowlais Works. The Messrs. Bailey are to supply 1,000 tons at 12*l.* 2s. 6d. per ton, deliverable in the Thames. The iron is to be equal to the best No. 3 bar-iron, to be made wholly of pure or mine-iron, puddled and hammered and rolled into bars, cut up, again heated, and rolled into rails. Messrs. Bailey have also contracted to supply the chairs suitable for 2,000 tons of rails, at 7*l.* 19s. 6d. per ton, cast upon an iron core, and from second fusion. Messrs. Guest and Co.'s contract is to supply 1,000 tons of rails at the same price (12*l.* 2s. 6d.), and also deliverable in the river; warranted to be of the best quality, finished in the best manner, and free from every imperfection. The condition of the whole of these contracts is, that they shall be completed before the 1st of June, it being expected that the line will be opened as far as Ilford in the coming June or July.—*Railway Times.*

London and Croydon Railway.—The works on this line seems to be pushed on with as much rapidity as the inclement weather will permit. The viaduct of thirty-six arches, at the junction with the Greenwich Railway, is now completed, and appears to be of the most substantial character. The foundations, owing to the uncertain nature of the soil, are laid very deep, and secured on beds of concrete. The whole brickwork is built of the best hard grey stocks; the joints having been all raked out one inch deep, and pointed with Parker's cement. This gives a dark appearance, which, however, is well counterbalanced by the durableness of the structure. A large skew-bridge, of forty-eight feet span, is in the course of construction over Earl's Sewer. The works of this important bridge have been suspended during the frost, but will be immediately resumed whenever the weather is suitable. The skew-bridge over the Surrey Canal, consisting of three arches—the centre one being forty-eight feet span, and the two land arches twenty-four feet span—is also complete. The pilasters, string-courses, and coping, all present the most perfect workmanship; the same means for filling the joints having been resorted to here as in the viaduct before-named, and the rings of the arches being laid with the utmost care spirally in cements. The bridge by which the Dover turnpike road crosses the railway, has been long finished; and, notwithstanding the extreme flatness of the arch, a mode of construction which was necessary to avoid altering the level of the original road as much as possible, stands perfectly well. Near to this bridge, on the north side of the turnpike road, a space has been walled in to form a station for passengers and the locomotive engines. The earthwork, which in this contract is very heavy, is going on rapidly. It consists of the deep cutting on the south side of the Greenwich road, for the most part through the formations composing the upper strata of the London clay basin. The cutting is performed on two levels, the materials from the upper being thrown into a large spoil bank on the east of the line, while those of the lower are used in the formation of the embankment across the marshes, which has reached within about sixty yards of the bridge across the canal. The slopes have been neatly dressed in the cutting, and sodded, which not only improves their appearance, but imparts stability to them. The embankment is founded on an inclined rampart, formed of turf, running about five feet under it, and projecting two feet beyond, and having the upper part perpendicular to the external slope of the embankment. This method, which is new to us, will give stability to the embankment, as well as preserve its shape, by preventing those sloughs, or slipping at the foot of the materials, which may be observed on most large embankments. Two tanks are in the course of construction for the purpose of Kyanizing the timber, previous to its being laid down; and preparations have been made for laying the permanent way. Contracts for the remaining portion of the works have been taken, and operations will be commenced as soon as the state of the weather will permit. At the junction of the railway with the Surrey Canal, a piece of ground has been provided for the purpose of a depot for goods brought by the railway, to be forwarded by barges to different points on the banks of the Thames; and near to London Bridge, another considerable plot has been purchased for the purpose of constructing such a station as to afford ample accommodation to passengers, not only by the Croydon trains, but also for the ultimate traffic of the Brighton and Dover lines, both of which, in furtherance of the original view of the projectors of the Croydon Railway, merge from this trunk near Croydon, and proceed respectively through the south and south-east districts of England; thus giving to the Croydon Railway the extensive traffic of these districts in addition to that derived from its own locality. In a subsequent Report we shall advert more minutely to the mode pursued in effecting the earthwork on this line; and shall also notice the works at the Croydon end, which are in a state of great forwardness, being nearly completed up to the Jolly Sailors public-house, at Norwood.—*Idem.*

Newcastle-upon-Tyne, Edinburgh, and Glasgow Railway.—We understand that Mr. Richardson, the engineer, has arrived in Glasgow to make preparations for a survey of the line from Glasgow to Peebles. We would strongly urge all that are interested in obtaining cheap fuel to encourage this project, than which we know none that is more likely to be advantageous to the public. The utmost enthusiasm prevails throughout the whole line for the accomplishment of this great national undertaking; and we trust that the merchants and inhabitants of Glasgow are too much alive to their own interest to permit a scheme of a direct communication from this city to London to fall to the ground.—*Glasgow Paper.*

Edinburgh and Glasgow Railway.—The projected railway between Edinburgh and Glasgow, is the only one in Scotland which may be called national, as uniting the two principal cities, the two seas, and a population, including adjoining towns and counties, of nearly a million. This is a measure which is called for on national as well as local grounds.—*Aberdeen Herald.*

Lancaster and Glasgow Railway.—It will be recollected that at the recent railway meeting at Kendal, it was stated with much confidence that twenty miles would be gained between Lancaster and Carlisle, by the main trunk passing through that town, over the line up the vale of Lune, recommended by Mr. Locke. The saving of 280,000*l.*, the computed cost of this imaginary distance, it was said, would see them a good way through the expensive tunnel of two miles at Kentmere. This saving of 280,000*l.*, and of twenty miles, was, of course, an important consideration, and one could not help wondering what Mr. Locke had been about to suffer it to escape him. All surprise on this point is now at an end. The last number of the *Westmoreland Gazette* contains an important letter from John Hill, Esq. (we believe of Ormside) showing that there is not a balance of *one mile in favour of the Kendal* over Mr. Locke's line, by Kirkby Lonsdale. We shall wait with some interest to see this statement controverted (if possible) by the projectors of the Kentmere line.—*Lancaster Guardian.*

Enormous Train on the Liverpool and Manchester Railway. — Monday morning, a luggage train arrived from Manchester, consisting of 113 waggons of merchandise, drawn by five engines. Allowing ten yards to each engine, and fifteen to each waggon, the train must have extended upwards of 615 yards.—*Liverpool Standard.*

The Birmingham and Derby Junction Line is proceeding favourably. The contracts already let include, with a trifling exception, the whole of the

ine from Hampden-in-Arden, where it joins the Birmingham, to Burton-upon-Trent. The Directors confidently anticipate that the undertaking will be completed by Midsummer of next year.

The Leicester and Swannington Railway Company have declared a dividend payable on the 1st of March, as follows:—Share, 50*l.*; amount paid, 50*l.*; last price, 75*l.*; dividend, 8*l.* per cent. upon paid-up share. Share, 50*l.*; amount paid, 5*l.*; last price, 25*l.*; dividend, 17s. 6d. or 17½ per cent. upon amount paid-up; equal to 10¼ per cent. upon both.

Thames Haven Dock and Railway Company.—We are delighted to see that this work is likely to proceed; one of so much use ought not to have been so long neglected. A dock independent of its own use and that of the railway, is always an object of interest in an architectural point of view; and we trust the Thames Haven Dock will be as beautiful in art as it is beneficial as a work.

Sheffield and Rotherham Railway.—The works of this undertaking are rapidly approaching to completion, and in all probability the line will be opened for traffic about Midsummer. The engines are now being constructed by R. Stephenson and Co., and first-class carriages have been ordered from Manchester. Workmen are employed day and night.

North Midland Railway.—The long-continued frost has occasioned considerable hindrance in the masonry department of this undertaking. The excavators have continued their work, and are getting on fast, but so much remains to be done near the town of Chesterfield, that it is intended to carry on the work by night as well as by day. In order to accomplish this an application has been made to the gas company, for lamps to be placed on the line, and a meeting was held on Friday week to make the necessary and requisite arrangement. The directors have made another call of £10, making the whole £35 per share. Upwards of sixty miles of road out of the whole distance of seventy-two miles is now in course of being made. The Aire and Calder Navigation Company have thrown every possible obstacle in the way of the Railway Company, and in consequence a new line has been surveyed from Leeds to the Cinder-ovens, beyond Haigh Park; and the directors may possibly be driven to apply for a new act to empower them to take this line.

London and Birmingham Railway.—The portion of the line between Birmingham and Rugby may now be considered as finished, with the exception of the works at the stations, as a waggon traversed the whole length upon the rails a few days ago, saving only a few yards near Church Lawford, over which it had to be got along by horse power. The road in several places seems as if it had given, or was inclined, as indeed is always the case with roads recently ballasted; but every attention is being paid to its consolidation, and it is expected to be in very fair condition by the time the stations are completed. Most of the buildings at the Birmingham station are completed, and the remainder are proceeding with in as urgent a manner as circumstances will admit of.

Accident on the Manchester and Liverpool Railway.—On Wednesday, the 7th ultimo, the eleven o'clock first class train to Liverpool was on its way to that town, and had arrived within four miles of its destination, when a luggage train was perceived in advance with three lurries attached to it. The proper measures for slackening speed were taken, but singularly enough at that moment the axle-tree of the hindmost lurry broke, and all three immediately separated from the train to which they were attached and were left behind. The consequence was that the engineer of the train following, which was still going at a quick pace, had not time to stop ere the engine bore down upon them, throwing the lurry off the rails, and scattering them in pieces across the line. The shock also threw the advancing engine off the line, and the train would have been left without the means of proceeding to its destination but that the engineer of the luggage train, who was but a little in advance, witnessing the shock, brought back his engine and took the train with very little delay forward. None of the passengers were injured, though the concussion created much alarm.

Manchester and Leeds Railway.—The works of this railway are now in active progress; contracts have already been entered into with responsible parties for about twenty-five miles of the line. The important works at the Summit Tunnel have also been let to respectable and experienced contractors, making altogether more than half of the line at present under contract. The works have been urged forward with all practicable expedition, and extensive preparations have been made for the most vigorous exertions in the spring of this year. The shareholders may therefore look forward to the completion of the entire line with all possible dispatch. The public, also, appear duly to appreciate the present promising aspect of affairs, the shares having risen in value from £3 to £4 each within the last month.

North Union Railway.—Within the last few weeks considerable progress has been made in the formation of the North Union Railway, between Preston and Wigan. The operations on the bridge across the Ribble have been very actively carried forward.—*Derbyshire Courier.*

Disaster at the Preston Railway Bridge.—Although the thaw which commenced in the latter part of January was mild, the masses of ice began to break on Monday morning; and about noon, the mass between Walton Bridge and the Tram-road Bridge, thickened by the sheets which escaped at intervals from the rapids up the river, broke from its hold with a loud crash, and floated till it reached the Tram-road Bridge, where, being intercepted, it again found a lodgment, and was stayed more than two hours. When this period had elapsed, the loud and repeated breakings gave signal of another general movement. The principal damage was done to the Railway-service Bridge, or the temporary line on which the materials for the erection of the bridge are conveyed; upwards of 100 feet are entirely carried away. A considerable portion of time will be sacrificed, but every precaution has been taken to meet any future emergency.—*Preston Chronicle.*

Railway Bills for this District.—The following notices of intended applications for Bills during the present session of Parliament have been given, connected with works in this part of the kingdom—namely, *The Clarence and Hartlepool Union Railway and Asylum Harbour*—to make deviations and alterations, to form a branch, a canal, and dock. *Great North of England Railway*—to alter, amend, and enlarge the powers of their former acts. *Maryport and Carlisle Railway*—to amend and alter former acts. *Morpeth and Tyne Railway*—for new line. *Newcastle-upon-Tyne and Carlisle Railway*—to raise a further sum of money. *Gateshead and Newcastle-upon-Tyne Railway*—new line from Gateshead to Newcastle. *Newcastle-upon-Tyne and North Shields Railway*—to make a branch from Shields to Prior's Haven, Tynemouth. *West Durham Railway*—new line from Brancepeth, to join the Byer's Green branch of the Clarence Railway. *Whitehaven, Workington, and Maryport Railway*—new line.—*Tyne Mercury.*

Fire from a Railway Engine.—On Wednesday, the 24th ult., such was the violence of the wind, that as the locomotive engine was being used to remove earth on an enbankment of the London and Birmingham Railway, about midway between Stony Stratford and Northampton, flakes of fire were carried a distance of forty-five yards from the railway over a farm house on the property of the Duke of Grafton, and being deposited in the rick-yard, occasioned the destruction of corn stacks and other produce to the amount of 700*l.*

The Grand Junction Railway Company have commenced the carriage of merchandise. In a circular just issued, the Company observe, that their present means of conveyance being limited, the rates are calculated accordingly. The present rates are as follow:—"*First Class.*—All metals in bars, rods, or ingots—nails, chains, rivets, and such goods—sugar, salt provisions, and the like—2s. per cwt. *Second Class.*—Hardware in packages—glass in boxes—heavy bale goods and boxes of linen—fruit, groceries, oils, &c.—wines and spirits—2s. 6d. per cwt. *Third Class.*—Tea—furniture, light bales and trusses—fish—glass in casks—fenders, tubes, and the like loose packages—3s. per cwt."

America.—The Wilmington and Raleigh Rail Road, when completed, will be 170 miles in length, of which about 30 miles are completely finished, and about 60 in a state of great forwardness. This road is in a straight line from Wilmington to the junction of the Norfolk and Petersburgh Rail Roads. It is expected the whole will be finished in about 18 months. At present a line of cars run over the road now finished, which enables us to reach Charleston in a fraction over three days. This road does not touch Raleigh.—*New York Express.*

Western Railway between England and Scotland.—We hope very soon to have before us a published statement of the progress that has been made in the matter of the survey of the Railway line between England and Scotland, by the way of Annandale. The survey, we believe, is now completed; and from Mr. Locke's report, in connexion with some additional levels taken by Messrs. M'Callum and Dundas, who assisted him, we understand that the formidable heights above Moffat can be got over without even a single stationary engine. What the Committee intend next to do we cannot yet say; but we presume they will watch the Railway Share Market, and if, as may be expected, we shall by-and-by have a new flush of commercial enterprise after the late depression, why then they may find that market again brisker than ever, and so, bringing their speculation forward, may meet a ready demand. Then, also, is the moment to lay their schemes before Government, and get national aid for the vast undertaking, when men's minds are on the alert with regard to it. We confess we are every day becoming more hopeful that it will ultimately be carried into effect, as we cannot suppose this bold and vigorous age will rest satisfied till it is done. We are speaking, be it remarked, not of the Annandale line precisely, but of some one Western line—for we believe we shall hear little of any other now but a Western line, to join Lancashire and Lanarkshire, the greatest seats in the kingdom for manufacturing industry. Meanwhile let us ask what the friends of the Nithsdale line are about? Are their funds made up? Are they ready for their survey? The thing seemed entered upon in several quarters in a spirit and feeling of very unnecessary rivalship with the Annandale line. There is no occasion for any such narrow jealousy. Let the thing be calmly gone about, and in the proper time let it also come before Government. A more thorough knowledge of circumstances connected with the great national undertaking of a Western line between the two kingdoms will thus be brought before the State; and the circumstance that two competing lines are submitted to its consideration, will rather corroborate the importance of the general scheme, by showing that men's minds in various quarters are made up as to its feasibility, than render Government reluctant from any difficulty of conflicting claims. For we are not for a moment to suppose that any subordinate advantage, by the way to this town or to that, will be allowed to sway and turn aside the one broad general calculation as to which line shall yield the greatest amount of benefit in a national point of view; and if Government aid is to be granted, of course Government will decide on the line to be adopted.—*Dumfriesshire Herald.*

Bristol and Exeter Railway.—In a recent interview of a deputation from the directors of the "Bristol and Exeter" Railway Company, the Lords of the Admiralty fully admitted that a point, either at Brean Down or Black Rock, on the coast of Somersetshire, on the line of that railway, will be the great national shipping and landing-place for communication between the Atlantic and the south of Ireland with the metropolis. We are not surprised at this admission on the part of such high authorities, as the fact is, letters and passengers will, we understand, by this route arrive in London, *via* the "Bristol and Exeter," and the "Great Western" Railways, in *four hours* from the coast, being as quickly in favourable tides as they would arrive in Bristol; and in tides which would be missed at Kingroad, will effect a saving in time

of at least eight hours, as compared with the route through the Avon. As compared with the route *via* Milford, the saving of time will be at least *one-half* that now occupied.—*Bristol Journal.*

The Berwick and Kelso Railway.—The company for this undertaking, which for years has exhibited itself as a chrysalis among the enterprising pursuits of our country, has, after various attempts having been made to thaw it into activity, been broken up—a proper termination to what seemed in capable of being inflated with vitality. We are far from regarding, however, the scheme of connecting the western country with this town, by means of a railway, one iota more unpromising from the death of this company. Every year, in our opinion, exhibits fresh inducements to such an undertaking, while no detraction from the original impetus has taken place. No one, we think, acquainted with the rapid advances made and still making in the manufacturing districts to which this port is the natural outlet, but must be led to see the demand for a railway. The determination which seems to exist in Newcastle, to push forward a railway from that town to Edinburgh, should have had some influence in staying this recent act of the Berwick and Kelso Company, as, in our opinion, whatever line is adopted for continuing the Great North of England Railway—whether it is carried through our neighbourhood, or through the midland country—in either case we think a railway between this and the west country is seriously desiderated.—*Berwick Advertiser.*

Glasgow and Ayrshire Railway.—We understand that vigorous preparations are making by the directors to have the works on this important line of rail way commenced in spring. Mr. Locke, the celebrated engineer of the Grand Junction Railway, has been appointed to execute the line between Glasgow and Paisley, held jointly with the Greenock Company; and Mr. Miller, of Grainger and Miller, has been named to execute the other portions of the railway.

ENGINEERING WORKS.

New Bridge over the Ouse at Selby.—The contractor has commenced driving the piles for the new bridge at Selby, for the Hull and Selby Railway Company. The bridge is on a new plan, and is peculiarly calculated to answer its purposes. The present bridge is what is termed a swivel bridge, but the new one will be a leaf bridge, opening in the centre, and drawing up one half from each end to admit vessels to pass. There will be a windlass at each approach, which may be easily worked, with the aid of balances, by two men, and thus the bridge will be raised in less than half a minute, and closed in the same time at most. The company have an active and intelligent resident engineer at Selby, who devotes his entire time to the superintendence of the workmen, and when complete, we have no doubt the Hull and Selby railway bridge (the first of the kind, we believe) will serve as a pattern for many others.

Mersey and Irwell Junction with the Rochdale Canal.—We understand that this work is proceeding most rapidly, that the contractor, Mr. Mackenzie, expects that an opening from one end of the tunnel to the other will be made in a few weeks; and that the canal will be completed by the latter end of September. It is astonishing that an undertaking such as this can be carried across a town like Manchester in so short a time (for it was only commenced in August last), with comparatively so little public inconvenience.—*Manchester Courier.*

NEW CHURCHES.

Nottingham.—A new church is in course of erection at Sneinton, near Nottingham, from the designs and under the superintendence of those eminent Gothic architects, Rickman and Hussey, of Birmingham. The plan is a Latin cross, with a tower (27 feet square externally) at the intersection. Interior dimensions 120 feet 3 inches from east to west, by 28 feet 3 inches wide, and the transepts 23 feet by 28 each. Gallery at the west end 28 feet 3 in. by 25; the whole affording accommodation for 1,250, including children. The interior is remarkably plain, owing to the timbers of the roof being in view, entirely devoid of ornament. The pulpit and reading desk are placed on each side of the chancel arch, the floor of the chancel being elevated two steps above the body of the church; the exterior is cased with stone from Coxbench quarry, near Derby, and presents an unique elevation, in the early English style, the chief feature being a wheel window of noble dimensions in the gable of the north transept. The total cost of erection, including architect's commission, is 4,000*l.*; but it is contemplated (if a sufficient sum of money be obtained during the course of erection) to raise the tower 12 feet (its present height being only 78 feet 6 inches), and place an elegant pinnacle on each of the angular buttresses; this, together with the insertion of tracery in the principals of the roof, will render this edifice the best specimen of architectural skill, combined with rigid economy, of which this neighbourhood can boast. H. G.

New Church at Stroud.—The contracts for the new church at Stroud are allotted, by her Majesty's Commissioners, to Messrs. Hawkins and Co., builders, of Bristol. The plans are designed by Mr. Foster, architect, of Bristol, in the early English style of the thirteenth century. The church is to contain 1,000 sittings; and it may now be calculated that the foundation stone will be laid early in March.

Stafford.—A new church is now building at Stafford, from a design by G. E. Hamilton, Esq. It will be of brick, ornamented with stone, in the form of a cross; with nave and transepts. It is to have a Norman tower, lance windows, and buttresses; and is intended to accommodate 600 persons, 300 of which will be free.

Bury.—A new Roman Catholic church was opened at Bury. It is a very handsome piece of architecture. The interior dimensions are 87 feet by 41 feet 9, and 35 feet 11 high.

PUBLIC BUILDINGS AND IMPROVEMENTS.

Surrey Lunatic Asylum is to be erected in course of the ensuing summer. The county magistrates have purchased a considerable portion of the Springfield Lodge Estate, situate near Tooting, the property of H. Perkins, Esq. A limited number of architects will be selected for sending in competition drawings.

Woolwich Dock Yard.—A very extensive engineer's workshop and foundry is about to be built near the new basin.

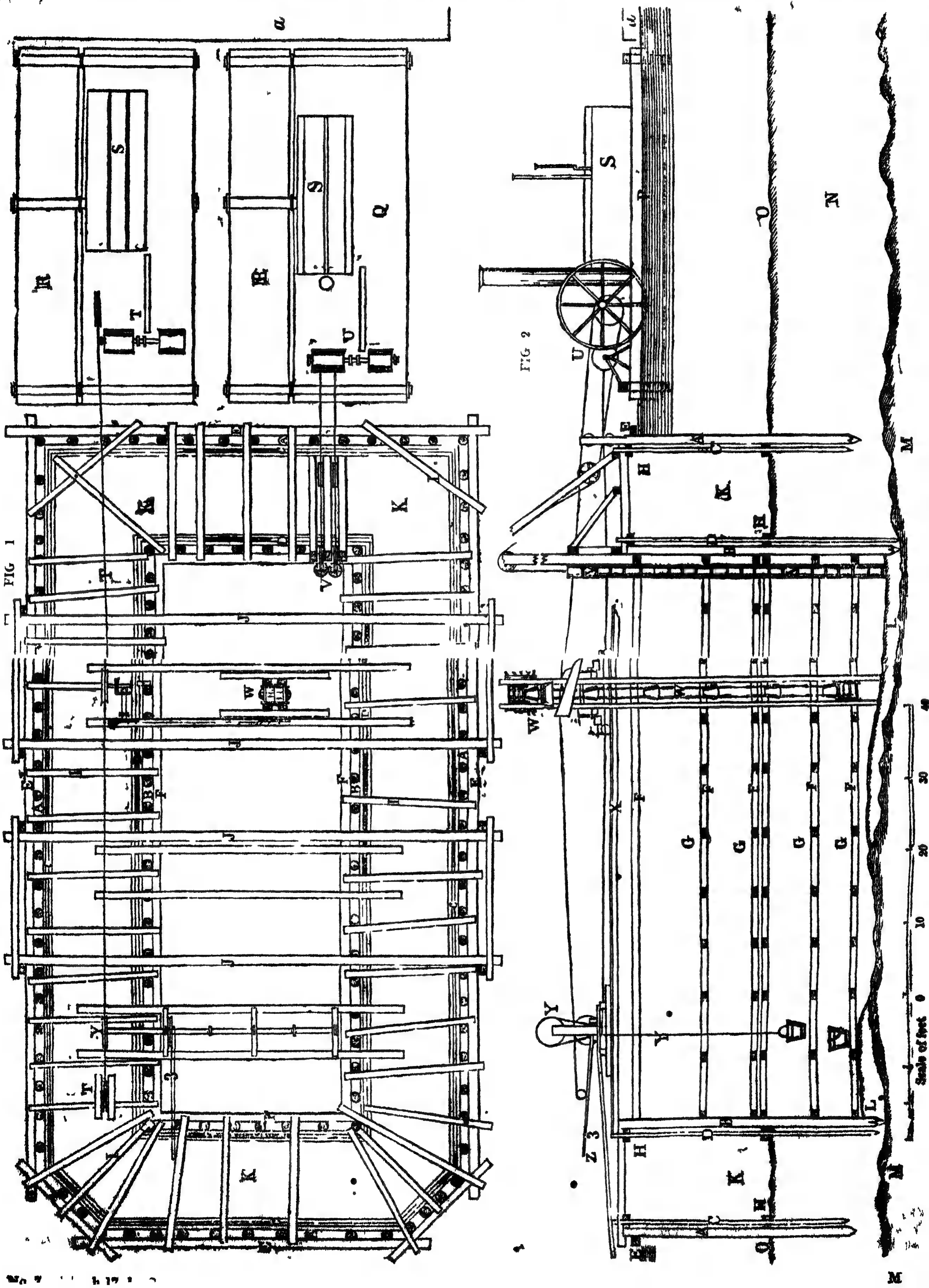
A monument has been recently erected in Lutterworth church to the memory of John Wiclif, the first translator of the Bible. It is the work of Mr. Westmacott, jun.

City Improvements.—The following is the substance of a Report made at the last Court of Common Council on the subject of the project of the new street from Farringdon Street to the northern road:—"The committee directed the Remembrancer to give the necessary notices of an application to Parliament for the promotion of the proposed new street northward as far as West-street. On the 24th day of November last they were attended by a deputation of magistrates of the county of Middlesex, and commissioners of sewers for the Holborn and Finsbury division, who stated their desire that in the application to Parliament power should be taken to continue the new street to Peter-street, near Cow-cross; and that although the commissioners had no funds applicable to the improvements, they were in hopes, that if power was given to take the property, funds might be found for that purpose; and the committee accordingly directed the Remembrancer to give the necessary returns to the owners and occupiers of property as far as Peter-street. Having taken into their consideration the best means of raising a sum of money for the continuation of Farringdon-street to West-street they were of opinion that a sum of sixty thousand pounds might be raised on the produce of the tolls payable at the several bars of the City, which they considered would be amply sufficient for the purposes required, and that the application of those tolls to the purposes of public improvements would in a great degree obviate the objections made by some persons to the payment of them, and they directed a petition to be prepared for an application to Parliament for the purposes aforesaid."

Rebuilding of the Royal Exchange.—At a meeting of the Royal Exchange Committee held on the 20th ult. at Guildhall, with closed doors, Richard Lambert Jones, Esq., in the chair, some business was transacted. Mr. Jones, as chairman of the deputation to the Chancellor of the Exchequer on the subject of the grant of a sum of money to defray the expense of building a new Exchange, informed the meeting that the deputation had been received with the utmost cordiality by the right hon. gentleman, who expressed an opinion that the citizens ought to avail themselves of the opportunity afforded by the late calamity to raise an edifice combining utility and splendour in a high degree; but observed, that the government could not aid them without the sanction of parliament; and that it would be therefore necessary to refer the matter to the Select Committee of the House of Commons on metropolitan improvements. The committee then proceeded to consider a communication from Mr. George Smith, the surveyor of the Mercer's Company, to the Lord Mayor, stating that the Royal Exchange tower was not in a state of security, and that it would be necessary to take the building down. The apprehension of insecurity, it appeared, arose from the injury done to the stone work by the frost after it had been exposed to the fire, and by the heavy rains subsequently; and it was the decided opinion of the surveyor that the tower should be taken down. Upon a former occasion a very strong opinion having been entertained by some of the members of the committee, that part of the old building should be retained, and that the future work should be rather a restoration of the old Exchange than the construction of a new one, Mr. Montague, the city surveyor, was examined on the subject, and he gave it as his most decided opinion that no part of the walls ought to be retained. The chairman said it would be a very extraordinary sort of judgment that could determine to keep walls 150 years old, when it was admitted that the tower, whose walls were quite new, must be levelled, and he thought very little of the understanding of any person who suggested so unreasonable a proposition. Mr. Smith admitted that Mr. Montague's opinion was correct, and Mr. Montague was convinced that for economical as well as other reasons, it would be necessary to take down every part of the building. It was then determined that the whole of the ruins should be levelled and disposed of as soon as possible by public auction, and that the entire site of the Royal Exchange should be cleared to the pavement, and we understand that immediate steps will be taken to accomplish that object. A gradual sale will take place, and the scaffolding at present erected will be allowed to be used for the removal, although raised, we believe, for a very different purpose.

Anti-Combustion Muslin.—We have now before us a piece of muslin, which, on being put into the flame of a candle, or thrown into the fire, merely carbonises, without flaming; so that any woman dressed in materials so prepared, cannot be burnt by any of those accidents by which the young and the aged too often suffer the most painful deaths. The finest colours are not affected by the process. It is equally applicable to every substance, from the canvass of a ship-of-war to the finest lace—for the curtains of beds, the furniture of rooms, the coverings of sofas, and all those materials which often cause conflagration. It also prevents the attacks of mildew. Papers subjected to great heat only carbonise, and leave the writing or the numbers and value of the bank-notes legible. The general utility of this discovery will command attention. We understand that a foreign government has commanded its use, and that a company is forming for its immediate introduction. The process, like all useful things, is simple in the extreme, and about as expensive as starching a dress.—*Literary Gazette.*

POTOMAC ACQUEDUCT.



Figs. 1 and 2, PLAN AND SECTION OF COFFER DAM, No. 2 PIER.

POTOMAC AQUEDUCT,

Connecting the CHESAPEAKE *and* OHIO CANAL, *on the North Bank, with the* ALEXANDRIA CANAL, *on the South Bank of the* RIVER POTOMAC, *near* GEORGETOWN, *in the District of* COLUMBIA, UNITED STATES, AMERICA.

REFERENCE TO FIG. I. & II.

A Main piles of large oak trees, sixteen inches diameter to outer scow.
B Ditto ten inches diameter to inner row.
C Sheet piling to outer row, six inches thick.
D Ditto to inner row.
E Wales, or outer stringers, one foot square.
F Ditto, or inner stringers.
G Four sets of shores across the interior of the coffer-dam, on a level with the bottom of the river is a double course of stringers and shores.
H Wales, or stringers, twelve by six inches, to guide sheet piling, called in America the lower and upper *sash*.
I Cross pieces and braces.
J Four main or *thorough* ties, connected at each end in pairs with cross-ties.
K Clay puddling.
L Mud or silt to be excavated.
M Rock bed of the river.
N Silt or mud.
O Bottom of the river; natural surface of mud.
P Surface of the river at ordinary spring tide.

MACHINERY.

Q Two floating steam-engines, of twenty-horse power each.
R Floating stages.
S Boilers.
T Gear for working dredging-machine and raising skids.
U Gear for working pumps.
V Two pumps, worked by a rope passing over sheaves, eighteen inches diameter, attached to a drum four feet in diameter.
W Dredging machine.
X Railway for dredging machine to run on.
Y Windlass, rope, and buckets, for raising the mud excavated.
Z Lever to put the windlass in and out of gear.
a wooden *scows* (flat-bottomed boats, or barges).

REFERENCE TO FIG. 3, 4, & 5.

a a, two sheet piles, thirty-seven feet long, thirteen by six inches, connected by two pieces of timber at the top *b*, and the same at the bottom *c*, called the upper and lower sash, or guides.

CAPTAIN TURNBULL'S REPORT

On the Survey and Construction of the Potomac Aqueduct, by Order of the House of Representatives.

POTOMAC AQUEDUCT, *Jan.* 1*st*, 1836.

Lieut.-Col. Abert, Top. Bureau.

SIR,—I have the honour to report, that immediately on the receipt of your order of the 20th of August, 1832, concerning the Potomac Aqueduct, I communicated the same to T. F. Mason, Esq., the President of the Alexandria Canal Company; and I soon after made the necessary examinations to enable me to determine the proper position of, the extent, character, and cost of the work. By these surveys were ascertained the depth of the river, from the plane of high water to the muddy bottom, and the depth and nature of the deposit beneath the river to the solid rock which underlies it; the direction and probable velocities of the current, and the length and direction of the aqueduct, and of its abutments and embankments; the quantity of excavation necessary to carry the masonry to a solid foundation, and the strength which should be given to the structure, to enable it to resist the pressure of the ice and other floating matter which is carried down by the freshets of the river.

The site of the aqueduct had been already fixed, in 1829, by Messrs. Wright and Roberts, engineers of the Chesapeake and Ohio Canal Company, as may be seen by their report of that year. Among the drawings which accompany their report, there is one which would seem to be a profile of the river, and to exhibit the depth of water and the mud beneath (see fig. 2); but in their report they state, that after the first sounding, which they made fifty feet from the shore, the iron rod which they had prepared themselves with for penetrating the mud was lost, and they think it safe to estimate the depth of mud from three to five feet for the remainder of the distance (1,530 feet), an estimate which it will be seen hereafter is very far from the truth.

My survey of the river shows a line shorter than theirs, and at the same time exactly at right angles to the thread of the stream, and nearly in continuation of one of the streets of Georgetown.

Influenced by the decided superiority of this line over that selected by Messrs. Wright and Roberts, and coinciding in this opinion with Mr. Fairfax, the engineer of the Alexandria Canal Company, with whom I at that period acted, we applied to the mayor of Georgetown for the consent of that corporation to use that street as the northern abutment of the aqueduct; and we suggested to him the idea, that it might be of advantage to the town to unite with the Alexandrians in constructing a roadway upon the piers of the aqueduct. This suggestion met with the decided approbation of the mayor, and he referred the subject to the councils, each branch of which appointed a committee to confer with the engineers; but the subject was not acted upon by these gentlemen. Six or eight months thereafter, however, when it became necessary to lay off the work for the contractors, they were induced, by the earnest solicitation of a gentleman of Georgetown, to meet the engineers on the ground. They were then unanimous in consenting to our using the street next west of the one designated by us; but not having power to act definitively, the matter was again referred to the councils, which took no further steps in the matter; and we were therefore necessitated to fix the abutment upon the site designated by Messrs. Wright and Roberts.

I narrate these facts, that professional men, commenting upon the position of the axis of the aqueduct, which is oblique to the stream, may be informed that neither Mr. Fairfax nor myself had any agency whatever in placing it where it is; but that, on the contrary, we were compelled, by circumstances beyond our control, to adopt it.

BORINGS OF THE RIVER.

The borings for the foundations were conducted after the method by which the main or framing piles of the coffer-dam for the tide-lock at the western termination of the Caledonia Canal were fixed to the rock, only that we used a square box instead of a cylindrical one; that is to say, the box was formed of three-inch heart pine plank, thirty-six feet long, eight inches in the clear inside, well jointed and banded with flat iron bars, the lower end of the box was shod with flat iron shoes, edged with steel, and fitted on the end of each plank, to prevent its being damaged by stones while driven to the rock; it was then driven in the ordinary manner of driving a pile, as far as it could be driven without crushing. It was then emptied by means of an auger, made in the form of a quadrant of a circle, of the same diameter as the inside of the box; the circular side, and one of the straight sides of this quadrant, for eighteen inches of height, were made close, of thin rolled iron, rivetted to the ribs, which were fastened to the corners of the quadrant; from this proceeded an upright shaft, the other straight side being open to the bottom of it. Four flat teeth, each two and a half inches long, were fixed with an inclination downwards, so that when the auger turned, these teeth loosened the sand, and prepared it to enter easily into the body of the auger. To keep it steady while turning, there was fastened to the lower side of that corner of the quadrant, which is the centre of the circle, a pivot six inches long, which passed into the sand, and served as a centre for the auger to turn upon. Immediately above this pivot stood the upright shafts, made of inch square bars of iron, capable of being joined by male and female screws, five and ten feet long, to any required length: upon this two cross handles were placed to turn it with. A scaffold was erected by spiking strong pieces of timber to the deck of the pile-driver scow; their ends extending beyond the planes, planks were laid across these for a platform, upon which four men stood to turn the auger. From four to six turns, according to the nature of the stratum through which it had to pass, filled it. It was lifted above the top of the box by a purchase acting from the top of the pile-driver, and the sand was then cleaned out with a small shovel, by a man standing upon the scaffold. At all the borings but one, where a stratum of coarse gravel two feet above the rock occurred, the box was driven to within a few inches of the rock, and in all cases when the box was emptied, a sounding-rod of iron, one inch diameter, was dropped into it, which rebounding several feet, proved that the solid rock had been reached.

At the point where the gravel occurred, about three fourths of the way across the river, reckoning from the north side, the first attempt to reach the rock was ineffectual, the gravel caving in under the foot of the box as the auger was withdrawn; and as the box was required for other borings, it was thought unsafe to risk driving it through the gravel until the others were completed; but when they were, the box was brought back to the gravel-bank, and driven with great force, until it began to spring or burst, although it had not yet entirely penetrated the gravel: it was, however, emptied to the foot, and a sounding-rod of iron was forced through the remainder of the gravel to the rock.

The box was always drawn by the crank of the pile-driver, with the assistance of a double and single purchase blocks. The number of borings were so multiplied as to prove the existence of rock under the entire bed of the river, at an average depth of twenty-eight feet (instead of twenty-five feet, as estimated by Messrs. Wright and Roberts) below the surface of ordinary high-water mark.

With the data thus obtained, a profile of the river was constructed, exhibiting the depth of water and mud to the rock.

The subject which next claimed the attention of the engineers was a plan for the purposed work. Having no instructions on this point, we were left entirely to the guidance of our own judgment, and to the influence of the

facts which my survey and examinations of the site of the work had brought to view; and these were such as to induce us to give to the plan a character of the utmost stability as it respected the foundations, and one of equal durability to the superstructure.

DESIGN.

It was to consist of twelve arches of stone, supported by eleven piers and two abutments, the arches to be one hundred feet span and twenty-five feet rise: the soffits to be curves of eleven centres, three abutment piers, being every third pier, to be each twenty one feet thick at the springing of the arch, and eight piers of support, each to be twelve feet thick at the springing; the masonry of the land abutments to be twenty-one feet thick.

This plan was approved of by the president and directors, with the exception of the superstructure, the cost of which being beyond the limited means of the company, was left for after consideration. The plan was further altered by rejecting the abutment piers, but eventually these were restored, on the recommendation of the engineers. A causeway of earth, 350 feet in length, was substituted for three of the arches at the southern extremity of the work.

The adoption of the causeway made a change in the arrangement of the piers necessary, and it was then decided that the aqueduct should consist of eight piers, 105 feet apart at high-water mark; two of them to be abutment piers, each twenty-one feet thick; and six of them piers of support, to be each twelve feet thick at high-water mark. The southern abutment to be twenty one feet thick, with circular wing walls thirteen feet average thickness at the base; sixty six feet in length on each side, to connect with the slope walls of the causeway.

The northern abutment, which is to be built by the Chesapeake and Ohio Canal Company, is not yet decided upon. Each of the piers to have an ice breaker upon the up stream end, in form of an oblique cone, sloping forty five degrees, extending five feet below, and ten feet above, high water mark, made of cut granite. The down stream ends to be circular, and to have a batter, or slope, the same as the sides, one inch to the foot.

Upon this plan the work has been commenced, and so far progressed.

TENDERS.

On the 29th of January, 1833, by the order of the board of directors, the engineer advertised for proposals to build the aqueduct upon the plan above described. Several offers were received, varying from 99,092·13 dollars to 217,909·63 dollars; among the number was one from Messrs. Martineau and Stewart, one of which firm (Dr. Martineau) afterwards submitted a proposition for the coffer-dams alone, proposing to build them upon a plan which he claimed as being original, and eulogised it for its supposed economy, and for the facility with which it might be constructed; this plan was submitted to the investigation of the engineers, who, after a careful examination of the principle, reported against it, under the persuasion that it was incapable of being made water-tight, and insufficient to resist the pressure of so great a column of water as must have necessarily pressed upon it. At the engineers' solicitation, however, Col. Kearney was requested by the board of directors to unite with them in their investigation of the plan. After a careful examination, he agreed with the engineers in the opinion of its total insufficiency.

During the winter and spring of 1833, the engineers were occupied in analyzing the various bids that were received, and which were from time to time reported to the board.

On the 8th of June, 1833, Messrs. Martineau and Stewart submitted a modification of their former bid, and the board of directors were influenced, by the professional reputation of Dr. Martineau, and the most unexceptionable assurances of the integrity and pecuniary ability of Mr. Stewart, to accept it; and accordingly, on the 29th of June, a contract was signed by them, by which they undertook to construct the piers and southern abutment, agreeably to the specifications of, and under the direction of the company's engineers; but the contract gave to the contractors a specific sum for each coffer dam, whereby the engineers were necessarily precluded from interfering with their plan, and the one which had been reported against by them, was then attempted to be built by the contractors.

CIRCULAR COFFER DAM.

It was formed of two circular rims, eighty feet in diameter, and supported one above the other by posts; the lower rim rested upon the mud, the other at the surface of the water; each rim was formed of pine timber 12 by 14 inches, in segments of ten feet in length, connected together simply by iron dogs; in the centre of each segment a rabbit was made, through which a pile, with a two inch plank spiked upon the back, was driven to serve as a guide pile; this divided the circumference into spaces or panels of ten feet, which were afterwards filled with piles of white pine, eleven inches in thickness, planed on the joints, firmly driven into the mud, but not to the rock. It was merely a single row of piles, without puddling to prevent leaks, and without shores to resist the pressure of surrounding water and mud.

The contractors evinced neither energy nor willingness to press the work forward, and it was not until the 2nd of September, when they sub-contracted the work, that it may be said to have been commenced, although some materials had been delivered previously. On the 26th of September the circular frame of the dam was towed to its position on the axis of the aqueduct, and on the 2nd of October it was weighted down to its place, bad weather having prevented its being done before that time; the driving of the piles around it progressed but slowly, there being but one pile driver employed; and it was not completed until the 16th of November.

A steam-engine of twenty horse power was placed upon a platform on piles, outside of the dam, on the down-stream side. December 15th, the engine being in readiness, it was put in operation at low-water, working eight pumps, capable of raising five hundred cubic feet of water per minute. At the expiration of one hour, the water in the dam had risen 8½ inches, equal to the rise of the tide outside, whereby was plainly shown the impossibility of emptying it. Several other attempts were made to empty the dam, but with no better success than the first, when the winter set in, and put a stop to further operations.

By the breaking up of the first ice, with which came also a freshet, about the 21st of December, the dam was crushed; and the contractors evincing no greater disposition to secure their property than they had shown to advance the work, the board of directors, on the 4th of January, 1834, formally declared the contract abandoned, and directed their engineers to take possession of the contractors' property, held in trust for advances made to them. They also directed the engineers to procure the machinery, &c., necessary for a vigorous prosecution of the work the ensuing spring.

In compliance with these directions, two steam engines, of twenty horse power each, were contracted for, as were also the vessels or scows necessary to receive the engines. Timber, stone, and cement, were advertised for, and the building of three pile drivers was immediately commenced, two of them calculated to be worked by horses, for driving the heavy oak piles; and the third, a light one, for driving the short piles, to be worked by a tread wheel; a fourth (received from the contractors), worked in the ordinary way, by a crank, was repaired. A machine for excavating the interior of the coffer-dams was also ordered to be constructed by H. Smith, Esq., of Alexandria.

Sixteen pumps were constructed, each of them formed of eight white pine staves, three inches in thickness, and thirty-eight feet long, and bounded together with iron; they were eighteen inches in the clear inside, at the upper end, and tapered three inches in the whole length, to facilitate the driving of the bands. At first they were left octagonal on the outside, but it being found very difficult to fit the bands, and make tight joints, they were afterwards rounded on the outside, and circular hoops substituted for the bands, which had been octagonal, as well as the pumps. Narrow slips of cotton cloth, coated with white lead, were laid in the joints between the staves; the hoops eighteen inches apart, well driven, made these perfectly tight.

The lower box, or valve of the pumps, was formed of a cast-iron plate, bevelled on its edges to fit opposite angles of the octagonal trunk; on each side of it was a leaf composed of two pieces of plate-iron, between which was screwed a stout piece of leather, trimmed to fit the sides of the octagon, these two leaves were screwed to the cast iron plate, the leather being the joint or hinge. In the top of the cast-iron plate, a ring was formed for the purpose of hoisting out the valve; in the lower part of the plate was another ring, or hole, through which a rope was passed to draw it firmly into its place in the pump, and, when there, an iron screw bolt, one inch in diameter, was passed through the pump at right angles to the valve; and, underneath it, to prevent its being forced further down by the column of water. The upper bucket was an inverted cone, twenty-seven inches in length, and of the same diameter as the pump, made of two thicknesses of short leather, well sewed together, through which was passed an iron rod, one inch thick and 7·4 feet long, projecting below the vertex of the cone 26 inches, upon which were placed leaden weights, secured by a screw nut on the end. The rim of the cone was divided into spaces corresponding with the octagonal sides of the pump, to which were secured rings, by means of straps of iron, one foot in length, passing in and outside, and rivetted through the leather by flat headed rivets. To these rings were hooked chains, which were suspended from the iron rod just below the eye or ring, at the top; through the ring at top was hooked a seven-inch rope of white hemp, which passed over a cast iron grooved sheave, three feet in diameter, placed immediately above the pump, and thence under another sheave of the same diameter, to the steam-engine, which worked it.

On the first opening of spring, March 1, 1834, preparations were made for removing the circular coffer-dam, built by the contractors, Martineau and Stewart. On the 4th of March the first pile was drawn, and on the 26th the whole of that dam was removed.

The piles were drawn by means of derricks or shears, erected on scows, by a winch, bolted to the deck of the scow, and by double and single purchase blocks. Two of these derricks were employed, and sometimes it was necessary to attach both of them to one pile; sometimes a lever was used to draw the piles; ordinarily, however, the single winch, worked by six men, was sufficient.

Experience in founding upon rock, at so great a depth, is very limited in this country, there being but one example, viz., the bridge over the Schuylkill, at Philadelphia, and that not strictly a fair example, the rock not having been entirely laid bare. I take the liberty of extracting from the report of the building committee, some notice of the difficulties which beset that work.

"A well intended, but mistaken endeavour to excavate all the silt and mud out of the dam, was arrested in time to save the whole from ruin.

"The balance of pressure of the exterior head of water, was perceived to be on the point of being destroyed; and the attempt of a total removal of the whole contents of the dam, was fortunately discontinued. The president, who, by constant attention, was minutely acquainted with the principles and construction, and of course the fort and foible of the dam, became uneasy; and intimated to the mason that the prosecution of the attempt of

the total excavation, was dangerous in the extreme; the mason was convinced that the opinion was correct, and the superintendent declared he had long been apprehensive of the consequences.

"At length the critical period arrived, when it appeared highly probable that another day's work would have defeated the whole enterprise. It was known that nothing but actual perception of the consequences would bring conviction, which all reasoning (resisted by the strong desire to reach the rock) had failed to produce. Several of the stoutest labourers were set to work, with a view to dig a pit to the rock, which was not more than three or four feet from the then surface; they had not pierced the mud above one half its thickness, before a column of water, copious and alarming, suddenly gushed up; this produced an immediate conviction of the unjustifiable hazard of any farther attempt to bare the rock; and the factitious foundation being without further hesitation agreed to, was forthwith commenced."

No descriptive memoir of drawings of this work ever having been published, nor of the London bridge, the deepest foundation perhaps in Europe, the engineers, therefore, had to proceed with the greatest caution; they were aware of the very exposed situation of the work, and impressed with the absolute necessity of founding it directly upon the rock, the difficulties and dangers of the attempt, although they were foreseen, were deemed subordinate to the great object of stability; and in this view, they were promptly sustained by the president and directors of the company.

The coffer-dams for the construction of the bridges of Neuilly and Orleans, designed by the distinguished Peronnet, were selected as models; but as these dams were for foundations of comparatively little depth, or such as were supported by piles, and where the water only was required to be emptied, alterations were found to be necessary to make them suitable to the great depth to be reached in this case.

COFFER-DAM, NO. 2 PIER.

See Fig. 1 and 2.

The coffer-dam first undertaken was to occupy the position of the pier No. 2, reckoning from the Virginia shore, and the next north of the one intended to have been built in the circular dam of Messrs. Martineau and Stewart, in a depth of eighteen feet water, and seventeen feet four inches of mud.

The figure of the dam - a parallelogram eighty-two feet long, by twenty-seven feet wide inside. The first pile was driven upon the axis of the aqueduct, which had been carefully established, and its distance from the southern shore carefully measured by means of a straight graduated float, on the 16th of May.

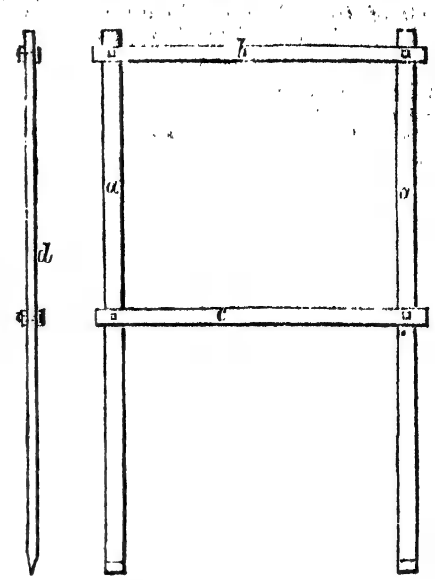
The inner row of piles were of white oak, forty feet long, sixteen inches diameter at the larger end, shod with iron, pointed with steel, weighing twenty-five pounds; they were placed four feet apart, from centre to centre, of each pile, and driven to the rock with a ram weighing 1,700 lbs. These piles were connected on the inside by a pine stringer one foot square, bolted with iron screw-bolts passed through each of the oak piles; the corners were secured by a strong iron strap with a gib and key.

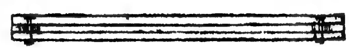
The outer row of piles, fifteen feet from and parallel with the inner row, was also of oak, thirty-six feet long and sixteen inches diameter at the larger end; they were placed four feet apart from centre to centre, and pointed, but not shod nor driven to the rock.

These were likewise connected by a pine stringer on the outside, one foot square, screw bolted to each oak pile; the up stream angles of the dam were cut off, so that the outer row of piles formed a hexagon, the angles were secured by the stringers overlapping each other three feet, and halved on to each other.

These piles were driven without bands on the butt ends, as customary; a method recommended by G. Whistler, Esq., formerly of the army, was adopted, viz., the butt ends were made concave, three-quarters to one inch deep, with an adze, and covered with a thin piece of sheet-iron, simply laid on, by which means a pile, it is believed, may be driven to any depth without injury.

Upon the two rows of oak piles, or rather upon the stringers, a scaffold was erected, upon which the pile drivers were placed for driving the sheet piles (pile plank), which were of the best North Carolina heart pine; those for the inner row were forty feet long, and six inches thick; they were driven in panels (montants) of sixteen feet, formed by bolting (the bolts having room to play) two pieces or guides, eighteen feet long, and twelve by six inches, to two pile planks, eight feet from the foot, the pile plank between the string pieces or guides (see figures 3, 4, and 5); the piles were then suspended in the planes of the pile drivers, placed at the proper distance apart, and lowered in their places, the guide pieces sliding against the oak piles; it was then driven by slight blows of two pile drivers, the ram of one resting upon the pile, while the other made a blow, and so alternately, until the cross or guide pieces rested upon the mud (even moderately long blows were found either to shatter the pieces below or to break the bolts which connected them); two other similar pieces were then placed near the top of the "montant" piles, one foot above high-water mark, and the whole of them were screw bolted to the oak pile behind it; when these panels were fixed around the inner row of oak piles, the sheet piles were driven so as to fill each, commencing at each end of them, and continuing towards the centre, the last or centre pile being wedge-shaped; the others were hewn and jointed, with parallel sides, by means of a plane, they were sharpened like a wedge, and bevelled on one corner, to force them into their places against the adjoining pile; although not shod they were driven to the rock.





The sheet piles of the outer row were of the same dimensions as the inner row, but they were only thirty six feet long; they were prepared and arranged in the same manner as those of the inner row, but they were not driven to the rock. See fig. 2.

An earnest desire to husband the company's funds as much as possible, was the leading motive for using short piles for the outer side of the dam. It was hoped that if these were driven a few feet (12 to 15) into the muddy bottom of the river, they might prove to be sufficient for the support of the puddling, at least until the interior of the coffer-dam should be so far emptied as to cause the preponderance of pressure to proceed from the outside towards the interior, and the experiment was the more readily attempted, inasmuch as the means were at hand to give additional strength to this part of the work. It proved, however, that the outer row of piling ought to have been driven to the rock.

The ram used for driving the sheet piles weighed 1,300 lbs.; two pile drivers were employed driving the sheet piles, one worked in the ordinary way by a crank, the other by a tread-wheel; the latter proved to be so superior, that the former was altered into a tread wheel. The crank required eight men and a superintendent, and made a blow from the top of the planes (40 feet) in seven and a half minutes, while the tread-wheel required but six men and a superintendent, and made a blow from the same height, and with the same weight, in one minute and fifteen seconds. The horse pile drivers made a blow in one and a half minute.

Both rows of sheet piling being completed, ties of eleven inches square pine timber were put in to connect them together; these ties were placed twelve feet apart, and were dovetailed into the heads of the sheet piles; this, from the apparent stiffness of the oak and sheet piles was deemed to be sufficient, but when the puddling came to be thrown in, the weight of clay forced the outer row to spring out, drawing the ties through the dovetails. Additional ties were therefore put in at every other oak pile, and they were notched on to the "montant" pieces, and secured down by rag bolts, and even these were found not to be sufficient to hold the rows of piles together, for as the puddling advanced, in many places the ends of the ties split off, and it became necessary to pass long and strong screw-bolts through the stringers of both rows of piles. This being done, the dam might have been deemed to be secure, but it even became necessary, as an additional security, to place stringers outside of the sheet piles, to notch them on to the ties, and to rag bolt them down entirely around both the rows, and even to place three long ties of fourteen inches square timber entirely across the dam, to keep the long sides together; this was done by driving two oak piles contiguous outside, and touching the outside stringer, two others immediately opposite on the other side of the dam, each pair of piles being connected together by a stout piece of timber across and bolted to them; the long ties which crossed the dam, were formed by scarping timbers, were notched on to the cross pieces, and secured to a pile at each end by stout iron straps.

These securities were the more necessary, because the stringers, ties, &c., were of white pine, which had been left in the circular dam, and which it was necessary to use.

(To be continued.)

REVIEWS.

Public Works of Great Britain. Edited by F. W. Simms, C.E. London: John Weale, 1838.

(Third Notice.)

The second division of this work is on canals, bridges, river walls, and the docks and port of Liverpool. The six first plates show the construction of the *Thames and Medway Canal and Tunnel,* executed under the direction of W. Tierney Clarke, Esq.; the description accompanying the plates describe the mode of working the tunnel, which passes through chalk and Fullers' earth; it also gives a description and drawing of the transit instrument used by Mr. Clarke for setting out the line of the tunnel, which method is now very generally adopted in setting out the direct line, and establishing the working shafts of such tunnels as are of considerable extent. The next plate shows the construction of the *Harecastle New Tunnel,* in Staffordshire; it passes through quicksand, clay, marl, iron-stone, coal, rock, &c.; its length is 2926½ yards, and is bricked throughout; the height is 15 feet, and width 14 feet; the thickness of the springing walls is two bricks, the arch one and a half brick, and the invert one brick thick; throughout the whole extent of the tunnel is a towing-path 4 feet wide, carried on arches with an iron guard rail on the side. The cost of the tunnel *per lineal* yard, including shafts and every expense, was 38*l.* 10*s.* Plate 93 contains the drawing, accompanied by a description of the locks erected on the Montgomeryshire Canal; the construction exhibits considerable skill and judgment. Plate 94 contains the plan of the entrance gates to the Gloucester and Berkley Canal, also the sections of the walls to the basin and sea entrance, showing the method of setting out the curvilineal batter by ordinates. Plates 95, 96, and 97, are very beautifully engraved; they contain the detail of the construction of the river wall to the embankment of Fishmongers' Hall. Plate 98 is also very beautifully engraved; it exhibits the cast-iron piling for wharfs, &c., as adopted for the Deptford Pier. Plates 99, 100, and 101, contain the drawings, accompanied by a specification of the works of High Bridge, over the river Trent, Staffordshire, designed by and executed under the direction of J. Potter, Esq.; the bridge is iron, of one segmental arch, 140 feet span versed sine or rise 14 feet, and width 22 feet; the springing of the arch is 5 feet above the water line, or 15 feet above the bottom of the foundations.

"The bridge was erected in 1830; the total weight of the iron work, which was executed by the Colebrook Dale Company, is 340 tons. The whole cost of the bridge was as follows:"—

Ironwork, delivered, fixed, and completed	£3,800
Masonry	3,193
Foundations, which were piled according to the most approved method; and the approaches, which are of considerable length and height	2,500
Total cost	£9,493

The next fourteen plates contain the drawings of a variety of canal bridges, locks, gates, and canal boats. The last plate of this division is a map, showing the relative situation of the docks of Liverpool and depths of the Mersey, accompanied by a very interesting account of the Port.

The first dock ever constructed in Liverpool was opened in the year 1690; and although this dock was filled up in 1827, and has become the site of the new custom house, yet the amount of dock accommodation has increased from that time until the present day, when the docks of Liverpool are so extensive, that with those now in progress they will contain a total area of water of 111 acres 4257½ yards, and presenting a broad quay space 9 miles and 83 yards long. The extreme length of the river wall, when completed, will be 2 miles and 1087 yards.

Table, showing the area of water and the quantity of quay space of the Docks, exclusive of the graving Docks, &c.:—

Names.	Area of Water in Acres and Decimals.	Quay Space in lineal Yards.
BASINS DRY AT LOW WATER.		
Prince's Basin	4·320	509
Seacombe Basin	0·373	188
George's Basin	3·383	455
George's Ferry Basin	0·278	160
Old Dock Gut (entrance to Canning Dock)	1·598	447
King's and Queen's Basin	5·039	601
Brunswick Basin	4·881	572
South Ferry Basin	0·605	205
WET DOCKS.		
Clarence Dock	5·767	740
Its lock	0·289	174
Half Tide Basin	3·637	586
Waterloo Dock	5·576	700
No. 1 lock	0·725	275
Half of passage	0·055	37
Prince's Dock	11·127	1187
Its two locks	0·677	426
George's Dock	5·032	645
Its two passages	0·504	356
Canning Dock	3·945	500
Salthouse Dock	4·651	666
Its passages	0·106	95
King's Dock	7·693	800
Its passages	0·112	75
Queen's Dock	10·382	1082
Its two passages	0·258	175
Half Tide Dock	2·591	407
Its passage	0·134	90
Brunswick Dock	12·438	1005
Its passage	0·129	87
Half Tide Basin	1·910	483
NEW DOCKS.		
Dock (next Waterloo Dock)	5·792	693
Its entrance Lock	0·108	72
Half of two passages	0·110	74
Dock (next Clarence Dock)	6·171	738
Half of passage	0·055	37
Lock	0·725	275

The expense of executing these stupendous excavations has been immense; and it appears from official vouchers that the cost of making the Prince's Dock alone amounted to 461,059*l.* 19*s.* 4*d.*, exclusive of the land, the estimated value of which is 100,000*l.*

The mean column of water which flows into the river Mersey, at the equinoctial, or highest spring-tides, is about thirty three feet five inches; at the mean spring-tides, twenty-nine feet seven inches; at the mean neaps, fifteen feet four inches; and at the lowest neaps, only twelve feet nine inches.

The third division comprises several drawings and descriptions of turnpike roads, executed by Mr. Telford and others; also the method of coking coal, the manufacture of iron and steel, a section of the mines at Abersyctan, in Monmouthshire, and the method of setting gas retorts.

The fourth and last division of this work contains "*A Scientific, Historical, and Commercial Survey of the Harbour and Port of London,*" by James Elmes, Architect and Civil Engineer, Surveyor of the Port of London. The frontispiece contains a very beautiful engraving of the "hemisphere," projected on the plane of the horizon of London.

"It is a fact not a little interesting, and combined with our insular station in that great highway of nations, the Atlantic, not a little explanatory of our commercial eminence, that London occupies nearly the centre of the terrestrial hemisphere."—*Sir J. Herschel.*

This division contains the plans of the following docks, very beautifully engraved, viz.:—St. Katharine Docks, London Docks, East and West India Docks, and the Commercial Docks; also detailed drawings of the lock gates of St. Katharine and the London Docks; likewise the entrance-lock of the East India Dock: there is also a map or chart of the Port of London, and a plan showing the method of mooring ships in the river Thames, and likewise the manner of laying down the mooring-chains. The accompanying letter-press to this division contains a great deal of valuable information respecting the history, privileges, and government of the port, and the various docks; also tables and memoranda connected with the tides and soundings of the river:—

The following observations on the course, dimensions, inclinations and velocities of the River Thames, and the effects which have been occasioned by the removal of the old and the building of the new London Bridge, are added. They are taken from a series of experiments and observations made on the river by Messrs. George and (Sir) John Rennie, during the years 1832, 1833, and 1834, communicated to and published in the report of the fourth meeting of the British Association for the Advancement of Science, held at Edinburgh in 1834, by George Rennie, Esq., F.R.S., &c. &c.

From these excellent observations and report are deduced that the general course of the Thames is from west to east. Like other rivers, it forms the drainage of a very extensive district, by means of rivulets and streams, which conduct the waters of the uplands into one great artery or trunk, and conveys them to the sea. The total number of these affluents may be about twenty.

It is difficult to estimate the superficial extent of country drained by the river Thames, but the authors of these observations estimate it as being at the least five thousand square miles. The course of the river is very tortuous and winding, particularly between Deptford and Blackwall, and is double

its length, circuitously, of its distance from its source to its mouth, measured by a straight line.

The navigable distance from London to Lechlade is about one hundred and forty-six miles and a half; but from Sheerness the total distance is two hundred and four miles and a half. The total fall of the River from Lechlade to low-water mark, is two hundred and fifty-eight feet, or twenty-one inches per mile; and this fall is nearly uniform, although there are places where the fall varies from nineteen inches to thirty-two inches per mile, as shown in the following table, calculated by those gentlemen, who observe, that in no instance is the funicular curve of M. Gerard established.

RIVERS ISIS AND THAMES.

Names of Places.	Length. Miles.	Frlg.	Fall Ft.	In.	Fall in feet per mile	Ratio of inclination.
From St. John's Bridge at Lechlade, to Folly Bridge at Oxford	28	0	47	0	1·68	$\frac{1}{3145}$
„ Oxford to Abingdon Bridge	9	0	13	11	1·73	$\frac{1}{3052}$
„ Abingdon to Wallingford Bridge	14	0	27	1	1·95	$\frac{1}{2708}$
„ Wallingford to Reading Bridge	18	0	21	1	1·31	$\frac{1}{4030}$
„ Reading to Henley Bridge	9	0	19	3	2·11	$\frac{1}{2467}$
„ Henley to Marlow Bridge	9	0	12	2	1·35	$\frac{1}{3911}$
„ Marlow to Maidenhead Bridge	8	0	15	1	1·86	$\frac{1}{2830}$
„ Maidenhead to Windsor Bridge	7	0	13	6	1.93	$\frac{1}{2738}$
„ Windsor to Staines Bridge	8	0	15	8	1·96	$\frac{1}{2693}$
„ Staines to Chertsey Bridge	4	6	6	6	1·41	$\frac{1}{3867}$
„ Chertsey to Teddington Lock	13	6	19	8	1·15	$\frac{1}{3641}$
„ Teddington Lock to London Bridge	19	0	2	9	1·45	$\frac{1}{36413}$
„ London Bridge to Yantlet Creek	40	0	2	1	0·52	$\frac{1}{101537}$
„ Lechlade to Yantlet Creek	185	0	218	0		
Deduct from London Bridge to Yantlet Creek	40	0				
From Lechlade to London Bridge	145	0				

"The velocity of the Thames might be expected," says Mr. George Rennie, "to follow the law of variation of the inclinations; but that the natural obstructions which exist in all parts of the river upwards, from bends, shoals, islands, weeds, &c., and the artificial obstacles from weirs, pound locks, fishing ayts, &c., render it impossible to ascertain the velocity correctly. Much depends also upon the volume of water passing down the river, and the use of *flashes*."

In general, the velocity may be estimated at from half a mile to two miles and three-quarters per hour; but the mean velocity may be reckoned at two miles per hour. In the year 1794, the late Mr. Rennie found the velocity of the Thames at Windsor two miles and a half per hour.

Sir John Hall, the active and intelligent Secretary of the St. Katherine Dock Company, has given the following information relative to the influence of the wind upon the tides in the Port of London to Mr. Lubbock, who has thought it of sufficient importance to print in his communication to the Royal Society in 1834. Sir John Hall procured the joint opinion of some nautical men, including Captain Compton, the Dock-master of St. Katherine Docks, and Captain John Fisher, R.N., the Superintending Harbour-master of the Port. The following is the result of their sentiments respecting the influence of the wind upon the tides in the Port of London.

During strong north-westerly gales, the tide marks high-water earlier than otherwise, and does not give so much water, whilst the ebb-tide runs out later and marks lower; but upon the gales abating, and the weather moderating, the tides put in and rise much higher, whilst they also run longer before high-water is marked, and with greater velocity of current; nor do they run out so long or so low. The reason assigned for this is, that the strong north-west winds drive the sea along the Dutch coast, through the Straits of Dover, and, consequently, away from the mouth of the Thames; so that the tides, during north-west winds, are always much higher on the Dutch coast, producing frequently ruinous flooding thereto, than upon the English coast. A south-westerly gale has generally a contrary effect, and an easterly wind gives some water; but the tides, in all these cases, always improve the moment the weather moderates.

Pursuing the subject in relation to the Port of London, Mr. G. Rennie observes—"That in the river Thames the motion of the current continues for some time after the tide has made its mark, which is undoubtedly owing to its momentum. In general, the tides of the river Thames have been found to observe considerable regularity, both in their elevations and periodical times, except when influenced by winds and floods. In comparing, however, the sea tide with the river tides, a considerable discrepancy is found to prevail in the elevations; in some cases, on account of the convergence or swelling of the tidal wave, on the principle of the conservation of mechanical force, as in the Severn, &c.; and in other cases a lowering of the surface by expansion, as in the Mersey, which is very narrow at its mouth."

Account of the Inaugural Meeting of the Society for Promoting Practical Design, &c., held at Exeter Hall, Jan. 11, 1838. London.

THIS pamphlet commands our most cordial recommendation, on account of the exceedingly great importance of the subject brought forward in it, which, though at first sight it appears to extend no further than the question, whether it be practicable to infuse better taste among the artisans employed in our manufactures, is one intimately connected with the commercial interests and prosperity of the country, and also with the moral habits and feelings of the people generally. Nor do we relish it the less, because, instead of being glossed over, and decked out altogether *couleur de rose*, our deficiencies, as a nation, in respect to art, are probed somewhat unsparingly by Mr. Wyse, the Member for Waterford, in the powerful and brilliant speech in which he addressed the meeting, and which, for its luminous, statesman-like, and philanthropical views, seconded both by intimacy with the subject itself, and nervousness of diction, can hardly fail to be perused with admiration. There are, it is true, a class of persons, namely, those whose pseudo-patriotism, cheap, ready-made, and warranted to look like genuine, who will, no doubt, be scandalized at finding a so much higher rank assigned to foreigners as regards all those productions of industry that stand in any degree of relationship to those of art: such persons are indeed at liberty to consider what is here said on that head as no better than slander towards ourselves; or they may comfort themselves and those who will listen to them with the idea, that while we are decidedly superior to all the continental nations in the material and skilful fabric of our manufactures, it is of little moment though we fall far short of them in what belongs merely to external appearance and taste. Yet even admitting we can very well afford to be satisfied with that intrinsic advantage over our rivals and competitors in the market, we cannot assure ourselves how long it may continue, nor that other nations will not, ere long, equal us in those mechanical branches of industry wherein we now surpass them, and thereby turn the scale altogether in their own favour; should not we in the meanwhile make some effort towards competing with, or rather excelling them, where they at present greatly excel us? One leading step, in such course, is to inquire unflinchingly into our own deficiencies, to set about rooting out the fallacies, deceptions, and prejudices which blind us to them, and to apply ourselves strenuously to the task of improvement.

It is undeniable, that in this country the arts have been looked upon as matters of mere luxury, as designed to minister to the enjoyment of those alone who can afford to pay for them; in short, as what does not in the least concern the working classes, can either interest them, or ought to be allowed to do so. This churlish spirit has manifested itself more than it ought to do, even among those who have, as far as purchasing liberally and paying large prices to artists go, been patrons of art in the most limited and vulgar sense of the terms. In this country the wealthy seem to collect only to entomb, while by permitting others freely, though under proper restrictions, to participate in their treasures of art, they would, in fact, gain much more in the character of the possessors of them, than they now do by the exclusiveness with which they keep them to themselves. One would imagine that a refined selfishness, if no better motive, would induce the owners to be less niggardly in allowing access to what, by being enjoyed by others, would not be at all decreased in itself; but rather confer upon themselves, in consequence, additional importance in public estimation. An Englishman, however, seems to be of opinion, that were he to allow his inferiors at all to participate with him in his taste for art, he should lower it, tacitly admitting that those so much beneath him could derive enjoyment from the same refined and intellectual sources as himself. Hence, although England is a nation famed for its charitableness, its charity extends no further than assisting the poor in their bodily necessities, as if they were mere animals which ought to be satisfied if their hunger be appeased, having no right to anything that looks like mere enjoyment or amusement. No wonder, then, that as Mr. Wyse remarks, "there seems to exist not only no connexion, but a sort of hostility between the upper and lower classes of society in this country." There are, indeed, little other points of contact between them, than when the former disgrace themselves by lowering their tastes and pursuits to the level of those of the most brutal and vulgar of their inferiors—prize-fighters, horse-jockeys, and gamblers. Unfortunately, none seem to care to show any sympathy with the lower orders, by affording them the opportunity of raising themselves up to them in any degree, as far as intellectual tastes are concerned.

Undoubtedly, one main cause of the sullen indifference to art which characterises the bulk of the people in this country, is to be found in the spirit of Protestantism; yet that would seem to be only an additional reason wherefore we should afford the people those facilities for an intercourse with art, which our national religion withholds from them. Instead of this, we have hitherto actually excluded them from the only two churches in the metropolis where there was any chance of their contracting any acquaintance with works of sculpture—St. Paul's and Westminster Abbey; and even now their doors can hardly be said to be freely opened to them. Had it been our express object to deter the people from in any way familiarizing themselves with art, hardly

could we have devised a system more effective for such purpose than the one tacitly adopted and pursued by us. How widely different all this from the practice of Italy, and other foreign nations, where, as Mr. Ewart observed in his speech, "galleries of art are freely, I might almost say, solicitingly open to the peasant as well as to the prince." So, too, as a female traveller has informed us, she met with groups of Bavarian peasants gazing on the frescos and reliefs in the splendid saloons of the new palace at Munich, adorned by the pencils and chisels of such artists as Cornelius, Schnorr, and Schwanthaler.

Fully do we agree with the same gentleman, when he afterwards says, "to enlighten and refine the public, by means of galleries of art, is in all cases desirable; but how much more desirable in climates such as ours. In ancient Greece, or in modern Italy, the out-door walk of a citizen would afford him a practical lecture on the principles of art"—(this is "Trade," in the original; but must be a misprint, which has been corrected accordingly,) "and the elements of design." Such are the external advantages of climate! Classic groups and classic bas-reliefs stood then beneath their noblest theatre—the open sky. Here such out-door exhibition is denied us; its place ought, therefore, to be supplied by exhibitions within doors. The portals of the arts should be liberally and gratuitously thrown open to the people." The exclusion of the people from any intercourse with art has operated injuriously in more ways than one, since it has driven them to coarse, brutalizing indulgences, as well as prevented them from competing with foreign artisans in all articles of fancy and taste; so that let the wealthy classes be ever so refined, as they do not design their own ornamental luxuries, they must, of necessity, either content themselves with costly but comparatively inelegant productions, or else supply themselves from continental markets. "Of the bronzes produced in this country," says Mr. Wyse, "placed beside those of France, and still more of the Prussians, our's are to be considered merely like Peter Pindar's razors, made to sell and not intended as works of art." Let us hope that this state of things will now be reformed, and that to our confessed superiority in the *utile*, we shall now strive to superiority in the *dulce* likewise. It is something to know, that a beginning has been made; and all success, we trust, will attend the Society for Promoting Practical Design, and others that may emanate from it. We have not, indeed, entered into particulars respecting it, because we hope that the pamphlet itself will be in the hands of all our readers, it being one that deserves to be most widely circulated and brought into notice.

Berlin und seine Umgebungen, &c.—Berlin and its Environs in the Nineteenth Century; a Series of Views engraved on Steel, after Drawings by Mauch, Gärtner, Biermann, and Hintze. With Historical and Descriptive Accounts. By S. H. Spiker, Royal Prussian Librarian. Berlin, 4to.

In the mode of its getting up, this work resembles "London in the Nineteenth Century," and "Pugin's Paris," there being two views on each plate; and as it is likewise *en suite* with them in its size, it may be considered as a contribution towards a general series, illustrating the architectural features of the capitals and principal cities of Europe; although such series is at present merely an imaginary one, and we fear likely to continue so; yet, if we may not hope that the other cities of Germany—and not those of Germany alone—will follow the example here set by Berlin, it is not too much to expect that some of our English publishers should send out an able architectural draughtsman to Munich or St. Petersburgh, at either of which places he would find ample employment for several months, without having occasion to wander about in quest of subjects which had escaped other pencils. Even Paris would by this time furnish quite a fresh harvest since Pugin's work made its appearance; for there is now the Arc de l'Etoile, La Madelene, l'Ecole des Beaux Arts, and we know not how many other splendid edifices that are either now at length completed, or that have been commenced and finished long subsequently to the date of the work above mentioned. But why should we refer to Paris, when there are Bordeaux, Lyons, and so many other places in France, that may be said to be kept veiled from us? Then, again, are there not Genoa, Milan, Vicenza? yet what English artist seems to think the palace-lined streets of the first, or any of the edifices of the two latter, except indeed it be Milan Cathedral, worthy of being commemorated by his pencil? That no one should have cared to exhibit to us any of Palladio's buildings either at Vicenza or elsewhere, as they actually show themselves, and set off, as they might be, by picturesque effect, in addition to the accompaniment of locality, is indeed extraordinary; all we can say is, that such neglect of them serves as one tolerably convincing argument among others, that they are sadly deficient in those enchanting qualities so liberally attributed to them by guide books, and by critics of a certain class. No, our sketchers and topographical likeness-takers have no eyes for Vicenza, or for Florence; neither have they for Venice, except it be for St. Mark's and the Doge's palace; nor for Naples, except it be for its bay. Between those two cities they behold nothing save Rome, the Eternal City, with which they contrive to bore us eternally, bringing home with them either views of buildings drawn over and over again before, or else mere scraps and bits—an old wall and some trees, with a group of figures, or something of the sort, that may possibly exist somewhere in Rome, yet are not a whit more interesting, instructive, or picturesque, than a hundred other old walls and trees that might be discovered without hardly wandering beyond the bounds of the bills of mortality. But we are waxing quite cynical, besides being in a very fair way of losing our way altogether, therefore let us betake ourselves back again to Berlin, with a speed far excelling that of all the steam-engines and railroad carriages in the universe. Hardly need we say, that Berlin contains many fine pieces of architecture, including one or two of Schinkel's masterpieces; among which, the first place must be assigned to the Museum: of this there are two views, one showing the entire façade, the other a partial and nearer view of it, with, in the foreground, the huge granite tazza in front of the flight of steps. Unfortunately, however, these two plates happen to be executed with less taste and intelligence than almost any others in the whole work. They serve, indeed, just to convey a general idea of the building, and no more; yet had it been ably treated, the view in which the tazza is so conspicuous an object, would have formed a most beautiful composition. As our readers may probably be curious to learn something of this enormous *tazza*, we may as well inform them that it is worked out of a single block of granite, found on the summit of a hill near Furstenwald, and is twenty-two feet in diameter. It was commenced in May, 1827, and brought to Berlin in the November of the following year; after which, the finishing and polishing it occupied two years and a half more. While it was in progress, forty-four of the workmen had a breakfast given to them in it, and were all able to seat themselves without the least inconvenience. The Museum itself is now pretty well known to English architects, by the designs of it in Schinkel's "Entwürfe," and also by what has been said of it in a paper on modern German architecture, in No. 27 of the "Foreign Quarterly Review."

The work contains several views of buildings at Potzdam, including the lately erected Nicolai church, designed by Schinkel, together with Charlottenhof, and some other villas in the environs. The view of the Gärtner-wohnung, or Gardener's residence at Charlottenhof, is one of the most striking and best executed plates in the work—most picturesque in point of subject, and clear and sparkling in effect. In fact, the whole scene itself might easily be mistaken for some refined ideal of an Italian or an Arcadian dwelling, with an open bower-like hall, partly shrouded by the luxuriant umbrage of vines, mantling its roof with verdure. Schinkel—for this is also a conception of his—has here displayed the versatility of his talent, and his power of imagination, with great geniality. It is, in short, just what one would picture to himself as the embellished residence of a poet or an artist.

Several of the plates are executed by Finden, and other English engravers; and among those by the one just mentioned is the view of the Mausoleum, erected to the late lamented Louisa of Prussia, of whom the interior contains an exquisite recumbent statue by Rauch, universally allowed to be one of the finest specimens of modern art. On each side of this figure stands a marble candelabrum, one of them embellished with a group representing the Fates, being by Rauch himself, the other similarly decorated with a group of the Horen, or Hours, being by Tieck, the brother of the poet, and one of the most eminent living sculptors in Prussia. We learn from the account accompanying this subject, that the statue was executed by Rauch at Rome, and that the vessel in which it was shipped was captured in the British Channel by an American one, but afterwards retaken by the English off Cadiz. The Mausoleum itself, which was erected by the late Ober-Baurath of Genz, the architect of the Mint at Berlin, has a tetrastyle Doric portico, executed in a reddish granite, and each column consisting of a single piece.

In one respect this work differs, and very materially for its advantage, from similar ones published in this country, namely, in the satisfactory character of its letter-press, which contains a great deal of desirable information; while that which for the most accompanies our English publications of a similar class, is either provokingly meagre, or made up of rambling, desultory matter, having but a very slight connexion with the objects purposed to be spoken of, and sometimes nearly passing them over altogether. The letter-press to Pugin's "Paris" is, for instance, most shamefully done in many parts; not only without anything approaching to criticism or remark, but abounding with actual blunders. Spiker's Berlin, on the contrary, is a really interesting accession to German topography.

Cheffins' Official Map of the London and Birmingham Railway, and adjacent Country.

Cheffins' Official Map of the Grand Junction Railway, and adjacent Country.

These two Maps are published by the authority of the two railway companies. They are very minutely and accurately drawn to a scale of half an inch to a mile; every station, tributary railway, village, market town, park, and other object worthy of notice within the distance of thirty miles of either railway, are clearly shown, together with their distances from the stations. Annexed to each map is a section showing the gradients and levels of the country through which the lines pass. Besides the above two official maps, Mr. Cheffins has had them reduced to a small scale, suitable to the pocket both for convenience and price. We strongly recommend these maps to every commercial house, and persons who are trading with any of the great manufacturing towns on the line, as they give a clear view of the relative advantages of the line for the convenience of sending goods, or travelling. The smaller maps should be in the hands of every person who intends to travel on either of the railways.

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS, No. 4.

COLLEGE OF SURGEONS.

"The most striking instance of Attic elegance, debased by meanness of application, is to be seen in Lincoln's Inn Fields, where an Ionic portico of majestic dimensions, and exquisite individual beauty, is attached to a front with which it has no more legitimate connexion than the helmet of Pericles with the head of a Quaker." It is thus that Mr. Wightwick, in his "Sketches by a Travelling Architect," briefly characterizes the original front of this edifice, which has, happily, been superseded by the new and extended façade given to it by Mr. Barry. How far the building now satisfies Mr. Wightwick I cannot judge; but I have met with some who are of opinion that the change has not been an improvement, on the grounds that in its first state the portico showed itself to far greater advantage than at present, and far more conspicuously.

That it showed itself most conspicuously and strikingly, cannot be denied, for it showed like a piece of velvet or brocade patched upon a coat of drugget. It was, in truth, a most choice morceau, a delectable tit-bit for Welby Pugin, whom it would fully have borne out, even far better than anything he has actually made use of in his "Contrasts"—better, infinitely better, than King's Cross, because it showed that even while copying a fine antique specimen, the architect had not the slightest feeling for or intelligence of it—not an idea in common with it; whereas, abominable as it is, the other has the merit of being consistently so—all of a piece, and in equally bad taste throughout. Except the portico, all the rest was not only plain, but absolutely paltry and mean, without the slightest evidence of taste in any part or feature, or in any one respect. It would have been ugly enough without the addition of the columns in front of it; with that addition it was an intolerable bungle—a first-rate architectural monstrosity. Independently of appearance and design, it was obvious that the house neither suited the portico, nor the portico the house; though it would have greatly puzzled a stranger to determine whether the house was built first, and the columns tacked to it afterwards, or *vice versa*. Most assuredly, however, he would never have imagined that the one was intended to be associated with the other, or erected by the same builder—architect he cannot be styled.

Greatly as I rejoice that that hideous front has disappeared, I am not at all sorry that a memento of it is preserved among the views in Jones's "London," because it bears testimony to the justness of my remarks, and to the skill and taste Mr. Barry has displayed in metamorphosing it into harmony and beauty; so that it now deserves to have the title of one of Byron's productions conferred upon it, and to be henceforth designated "The Deformed Transformed."

All this is easily said; it amounts to nothing more than an avowal of decided dislike, akin to that expressed in the well-known lines—"I do not like thee, Doctor Fell," &c. Now, mere liking or disliking is not criticism; therefore, unless I can bring forward some kind of reasons and proofs—be they good or insufficient ones—in support of my allegations, I might as well keep my opinion to myself, or the reader might as well take that of the first person he should meet in the street. Yet, sorry am I to say (as I here do, *par parenthèse*), that of so-called criticism, more especially architectural criticism, a very large proportion must be saken upon implicit trust. "This is exceedingly fine—that is detestably bad," so sayeth Critic; yet, wherein the excellence or the vileness consists, people are left to puzzle themselves to make out—for the reason that it would strangely puzzle Critic himself to explain it to them, and that is the only reasonable part of the business. In more than one instance, my predecessor, Ralph the First, has shown himself to be a critic of that stamp; to wit, when he assures us that the east of St. Martin's Church is "remarkably elegant, and very justly challenges particular applause," yet evidently did not think it worth while to point out to the less discriminating in what its "remarkable elegance" consists; owing to which truly unfortunate reticence on his part, I, his unworthy successor, for one, have never been able to discover it.

After this small digression—whether an impertinent one or not, the reader will decide according to his own fancy—let us return to our *muttons*, as the French phrase expresses it.

Independently of the utter dissimilarity of character between the portico and the building behind it, in the old front, there was no due relative proportion as to size. The colonnade was either too long or too short; as a central feature, it was the former; as more than that the latter, since it stopped short, leaving only a very insignificant bit on each side of it. The same holds good in respect to height: as a mere porch, subordinate to the general mass, it was too lofty; while as the order marking the principal mass, it was too low. The parts behind it did not rise up as an attic superimposed on the portion connected with the order; neither did they (as they have since been made to do) constitute a main edifice, to which the colonnade was to be considered only secondary. In regard to design, it was no more than a wall with so many naked openings for windows, some square-headed, others round—a proof, perhaps, that variety had been studied—and two of them so placed, that had the lines of the cornice to the portico been continued as they now are, they would have cut them. Those windows, therefore, more ingenuously than ingeniously, indicated that there were some *entresol* rooms, against which the cornices alluded to came nearly midway. Perhaps I might have spared myself the trouble of saying the "cornice alluded to," because other cornice there was none; the building presented no indication of being terminated and completed, but was, architecturally considered, a mere crude and *inorganized* mass. Now in itself this might have been endured, excused on the score of economy, and only negatively defective. It becomes a very different matter, when to this excessive homeliness and dowdiness is added the parade of a portico. The whole is then rendered a ridiculous compound, exhibiting blundering pretension, false and beggarly niggardliness, with equally false and beggarly dignity. A person in a drayman's or dustman's jacket, with half a dozen footmen in laced liveries behind him, would not be a whit more preposterous. No; if the College wished the architect to make their house a little smarter, he should have recommended to them a modest porch below, and a *neat* viranda—something of that sort, spruce and *Londonish*. Truly it was a most *owlish* affair for him to go to Athens, *i. e.*, to Stuart's "Athens," in quest, I will not say of a model, but a pattern for a row of columns, which, without the least adaptation, I might say without taking the trouble to adjust to his building (for as a cloak, surtout, or what is called a *cover-slut* to it, it was too scanty), he claps in front of it. Why, even a female artist would not betray such disregard to propriety and unity; a milliner would not recommend a full-dress cap as a part of breakfast-table costume, or a velvet cloak, trimmed with ermine, to be worn with a dress of very ordinary materials.

Economy and taste were both outraged and scandalized in the first design for the College of Surgeons; since where was the economy of erecting a naked front, begrudging it the slightest degree of ornament, yet afterwards flinging away a sum greater than what was so saved, by attaching to it a superfluity, an excrescence, a contradiction? Such a proceeding is the very reverse of economy. That the architect should have suggested—or if he did not himself suggest, have listened to so preposterous an idea as that of *doctoring up* his design with such a colonnade as he applied to it, was the less excusable, and argued utter barrenness of invention, as there was his bare wall of a front for him to operate upon, to fill up, plump out, and put into good condition, in contriving which he might have given free scope to his imagination, supposing him to have possessed a particle of it. Neither can I believe that the College would have refused to listen to his remonstrances against the portico, had they been properly urged; since those gentlemen in this case became the patients, and in such capacity would hardly have insisted upon acting so contrary to all medical precedent and etiquette, as to write their own architectural prescription, and leave the doctor whom they had called in nothing else to do but to perform the office of apothecary and make it up.

But come, this reads too much like a long parenthesis crammed with satire. The "*Friends to Liberal Criticism*" will never endure this—perhaps not even comprehend it. Therefore *allons*: within this *classical* portico there was no central doorway, but an arched window in the middle, with a snug arched door with a fan-light—just such as

would built a stable, or some building of that kind—on each side of it. How well these comparatively diminutive arched holes in the wall accorded with the columns paraded in front of the building, may easily be conceived. Independently of this, there were evidences of bad taste that would have been offensive had there been no columns at all; for the arched head of the windows was divided by the upright style of the folding sashes being continued, and thereby producing a most harsh and disagreeable effect, the semicircle being cut into two quadrants.

"But the order itself, good critic, was not that admirable—quite a specimen of Attic elegance, as Wightwick says?" Softly, of that I will not be quite positive; to confess the truth, I have my misgivings on that point. As far as general form and expression went, undoubtedly such was the case; indeed, it would have required some ingenuity to miss such a degree of the original character, the columns being in their proportions and contours nothing more than express copies; and every one is aware that architectural copying of such things is altogether a mechanical affair—nothing else than adhering to the proposed pattern already set. But the order was exhibited stripped quite bare, and its members denuded of all finish, so that it preserved no other characteristic of the original than the voluted capitals. All else was impoverished even to chillingness—a mode of proceeding directly the reverse of that pursued by the Greeks, whose practice it was, as we now well know, to treat their primary architectural forms as a ground-work for embellishment, not of sculpture only, but of colouring likewise. Yet, as if it was not sufficient that the order should be shorn of all finish, and rendered as bald as possible, it was *barbarised* still further, by the addition of a monstrous oval shield and its supporters, apparently the design of some artist in the Heralds' College, which was stuck up over the centre of this *soi-disant* Attic colonnade. Peace be with it! it is now defunct and gone, and may we never clap eyes on its like again.

Such was the wretched front which Mr. Barry was called upon to throw into Medea's caldron, and metamorphose into a pile fraught with harmony and beauty. He has performed his task most ably, and now that it is achieved, it may appear to have been very easy; yet, I very much question whether many would have accomplished it half so well, though there can be no doubt that almost any one could have made something many degrees superior to the first building, its faults being so very glaring and outrageous. Yet although the new architect had thus much in his favour, that the front was to be extended, he was also trammelled by the circumstance that the portico was to be retained, and was of course obliged to regulate his design and the character of the whole building accordingly. As the additional extent was given by taking in the adjoining house on the east side, this of course threw the portico out of the centre, yet it fortunately happened that uniformity could be again restored by merely taking down the column at the west end of the portico and removing it to the other angle, leaving all the others untouched. To carry up the same portico higher was impossible, therefore Mr. Barry very judiciously decided upon treating it as an adjunct to the building, making the latter principal and the other secondary in his design; yet this did not deter him from fluting the columns, and enriching the mouldings of the entablature, as he was aware he could sufficiently counterbalance such degree of decoration there by the depth and richness he intended to bestow on the *cornicione* which crowns and finishes the whole mass. Indeed, had he not so finished up the portico, it would either have looked far more bare and cold than at first, owing to being contrasted with the exceedingly rich line of cornice above it; or else he must have greatly moderated that cornice, out of discreet regard for the portico itself. Had he, however, adopted this latter course, the result would have been, that instead of forming, as it now does, a fine termination to the whole composition, and imparting to it an air of unusual dignity, the upper cornice must have been considerably reduced, and would no longer have been of sufficient consequence for its important situation. The extension of the front, and thus gaining an additional window on each side the portico, to say nothing of expunging those which before intruded themselves between those of the second and upper range, has materially benefitted not only the general design, but the portico itself. The only thing which, in my opinion, operates rather as a drawback on the merits of this façade is, that the windows are rather of too plain a character for the rest. I could, therefore, wish that the architraves of those on the ground floor and the one above it—those at least external to the portico, had had somewhat bolder and richer architraves, so as to have been more in keeping with the decoration bestowed elsewhere.

There are two things, however, which deserve to have attention particularly directed to them, being of a kind apt to be overlooked, and certainly not sufficiently attended to by architects themselves, viz. the chimneys, and the piers separating the court from the street. The first are happily imagined, and tell very effectively in a side view of the building. The others exhibit a most elegant mode of decorating by rustic work, or rather tooled surfaces, so as to produce an effect at once delicate, picturesque, and rich. The interior of the building is also exceedingly well worth seeing; but it is time for me now to conclude, neither will my silence in regard to it prove a very serious omission, since it has been very fully described in the last volume of the "Companion to the Almanac."

PHILOTECHNICOS, No. 3.

Stained Glass.

The splendid effect produced by the use of stained glass is too well known to need our eulogy, for who that has visited any of our cathedrals, has not experienced its delightful sensations? The beautiful and varied hues of the glass, which cast their mellowing tints on every object around, operate on the mind, and create a kind of reverential awe for the structure wherein their beauties are diffused, and which are so much the more in keeping, when the building partakes of a sacred character. Although this feeling exists in the mind of every man, there are but few instances in modern times where stained glass is in any way introduced, as may be witnessed in most of the new churches, for rarely do we find its introduction in any of them, excepting, indeed, where some private individual, possessing more taste than the generality of mankind, "presents a painted window to adorn the altar;" but these are instances but "few and far between;" it is but very seldom that any other than that of the common glazier is ever exercised in the windows of our modern churches, where, indeed, excessive parsimony seems to be the only order of the day. It is a fact, hardly credible, that so little is this kind of decoration patronized, that it would be difficult to find half a dozen artists in the whole country who are engaged in this branch of the arts; and even of those few, there are but two or three of any eminence. How is this, when the propriety, the aptitude, nay, the almost absolute necessity for its introduction, cannot be denied? Is not a well painted window, representing some interesting scene selected from the Scriptures, with all the brilliant variety of light and shade that glass is capable of producing, far more appropriate than the coloured canvass, which, although executed in the first style of excellence, will come far short in the comparison? England, where is thy boasted taste? where thy sons, who profess so much filial regard for ancient beauties, and regard not this? Are they among the temples of the classic land, storing their minds with the magnificent conceptions of early ages? Are they exploring those exhumed towns, Herculaneum and Pompeii, to find examples worthy of England's imitation? Or do they wander in more distant climes, to gather sweets from every land; and, when well laden, like the bee, return to enrich their homes? If so, 'tis well; but why seek they the lily and forget the rose? Have they not both attractive powers? Should not the one, of native growth, be nourished in preference to that of alien soil? Why spend thousands in a foreign land to obtain some novel beauty, while at home the loveliest is left forlorn? Yet so it is; the quays of our rivers are laden with the produce of foreign artists, when those of England are neglected, and thousands distributed abroad that might have supported numerous, and, in many respects, far more talented native artists. In no instance are these remarks more fully verified than in the present want of encouragement to the stained glass artists. Many persons have an extraordinary notion that the art of painting in glass is lost. Lost, forsooth! why the idea is the most fallacious that ever existed; and so far is it from the fact, that the present state of excellence was *never* before equalled. There is no colour under the sun, not even the boasted ruby of the ancients, but can be imitated in stained glass—blues, from the palest steel to the darkest purple; rubies, from the lightest pink to the deepest scarlet; and, in fact, every variety of tint and colour can be produced by the artists of the present day, and not in separate pieces only, as did the ancients, but on one and the same piece. The old method of painting consisted in having a separate piece of glass to each colour, and shading it with brown, which was the only colour that they used with the pencil, consequently they never could aim at perspective. Their pictures are all flat surfaces, divided into an infinity of parts, and without the least pretension to drawing, as may be seen upon examination of any of the great windows of our cathedrals, and particularly at King's College Chapel, Cambridge, where the effect, with all these deficiencies, is beautiful; and yet it is with the utmost difficulty that the outline of any of the subjects can be traced. How different are the productions of the present day, where perspective, good drawing, and *chiaro scuro* are all studied and obtained.

We have been led to make these remarks, in consequence of a recent view of a splendid window now executing for Upwell Church, near Wisbeach, under the munificent liberality of the Rev. G. Townley, by Messrs. Hoadley and Oldfield. The window is twenty feet high and twelve feet wide, divided by mullions into three compartments, to be filled in with scriptural subjects; the centre is taken from Spaniolette's clever picture of "Christ's Descent from the Cross," the full size of the original, viz. eight feet six by five feet eight; and those on the sides represent "Christ Appearing to Mary Magdalene," and "His Bearing of the Cross;" the upper part is filled in with ancient Gothic canopies, and the sacred emblems of the cup, the shower of manna, the brazen serpent, the celestial crowns, the cloven tongues, the rock of Moses, &c. The part already executed of this splendid work is of such a superior and masterly style, that it defies the pen to write in words of sufficient praise; the immense depth of colour—the natural fleshy appearance of the face and hands, the expression of feeling, the boldness of the drapery, and, above all, the awful and deathlike appearance of the Saviour, is superior to any thing of the

kind which we have ever beheld. The deep blue and the ruby are here seen to vie with any early production, and not executed, as in those times, in "pot metal," but actually enamelled on the glass. The lights are thrown in with such brilliant transparency, that they illumine the whole subject, so as to produce in the mind feelings of the most intense interest. We sincerely hope that before this *chef d'œuvre* of art is removed to its destination, that the reverend gentleman for whom it is executed will permit it being exhibited in the metropolis, and let the rich and liberal-minded know that we have in England artists equal in talent to any in the world, and capable of producing works of almost unlimited beauty.

The many other beautiful specimens of stained glass produced by these artists would really deserve a separate notice for each, were it not for the fear of occupying too much space; we will therefore only briefly notice a few of them, and perhaps the one of "Belshazzar's Feast," after Martin, may be considered the most interesting; the size is thirty inches by nineteen. The figures are drawn in with the most minute and astonishing correctness, and the magnificence of the architecture and surrounding scenery is wonderfully enhanced by the modulation of tints, consequent upon the use of so transparent a medium as glass. It is painted upon one sheet of glass; and for variety of hues, brilliancy of effect, and excellence of workmanship, perhaps was never before equalled. This *ne plus ultra* of art was purchased by the Duke of Northumberland; and in order to preserve it from damage, it was enclosed between two thick sheets of plate glass, and secured in a strong frame. A second copy was likewise painted by the same artists, and purchased by an *American!* Several other subjects were painted by the same artists, after Martin, among which were "The Fall of Nineveh," "The Opening of the Sixth Seal," "Joshua commanding the Sun to stand still," and "Love among the Roses;" a series of the most perfect gems that can well be imagined.

Harlow's "Kemble Family" was likewise imitated with equal ability, and coloured after the original, the dimensions of which are thirty two inches by twenty-two. Besides the above, Messrs. Hoadley and Oldfield have painted numerous subjects for church windows. Those of "Faith, Hope, and Charity," after Sir Joshua Reynolds, claim unqualified praise; the exquisite beauty of the female forms, endearing simplicity of the children, the depth of colour, the graceful folds of the drapery, and the purity of taste exhibited in the canopied enrichments, are really the *coup de grace* of excellence.

These artists have painted four sets of the figures—one, for Charles the Tenth of France, which obtained the gift of a medal from the French Institute; another for the church of St. George's in the East; another for the New Church, at Calcutta; and the fourth they have still in their possession. The large window in the new Margate Church, of Gothic foliage and other ornament, was also from their hands. In imitation of the old style, they have painted two large windows in Petworth Church, representing angels surrounded by Gothic foliage; and so exact is the representation of the ancient character, that it is almost impossible to discover them to be of modern production. We could enumerate many other paintings of great beauty and excellence, by which we have, at various times, been gratified with the view of, by the kindness of Messrs. Hoadley and Oldfield, who lately publicly exhibited several of them in Regent Street, and at their own residence in the Hampstead Road.

We cannot leave this subject without expressing our admiration of that splendid work of art, "The Field of the Cloth of Gold," exhibited some years since in Oxford Street, but unhappily destroyed by that uncompromising element, fire. It represented one of those splendid tournaments in the time of Henry the Eighth. The portly king, accompanied by Cardinal Wolsey and his other usual attendants, were seated in the rear, to view the gorgeous pageant that occupied the foreground, where the armour-clad knights were preparing for the tilt, and encouraged by the bright eyes of the many lovely ladies of the court, by whom they were surrounded. The *coup d'œil* of this picture exhibited a mass of gorgeous magnificence; every depth of tone and colour were seen in the several details; the splendid dresses of the females, the polished surfaces of the armour, and the whole of the "trappings of royalty," were depicted with wonderful brilliancy and effect. This window was the production of Mr. Wilmshurst, assisted by Mr. Bone and several other eminent artists, and intended for a baronial hall; it was purchased on speculation, and for some time exhibited before it met with its untimely fate.

The process by which the painting in stained glass is produced is as follows:—The glass, which is the best Newcastle crown (and not too thick, or it will be liable to fly in the firing), is first coloured with a light neutral tint for the ground; the outlines are then drawn in on the reverse side in Indian ink; it then passes the fire, which must be done with great care, as the heat must be so nicely regulated, that the glass may not be liable to melt, which would be the case if the furnace were too highly heated; and on the contrary, if the furnace be not sufficiently heated, the colours will not fix. The fire is then allowed to go out, and the glass gradually cooled; it is then taken out and placed against a large sheet of plate glass, supported by a frame easel, against a strong light; the stains are then put in, with the lights and shadows in enamel, and again passed through the fire; these tints and shadows are strengthened several times, passing the fire each time, until the proper depth be obtained. The picture is usually divided into several pieces of different shapes and sizes, according to the form of the outlines or shadows, and put together with lead, and so completely are the joints usually concealed, that the whole picture has the appearance of one extensive sheet of glass.

The colours are prepared from oxides of different metals, combined with fluxes, but neither those of vegetable or earthy bases will answer the purpose, as they volatile in the fire.

Embossed Glass.

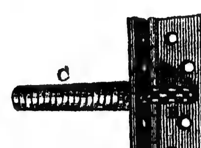
This kind of glass has the appearance of burnished and dead silver, and produces a chaste, quiet, and elegant effect, and when applied to Grecian ornament is in beautiful harmony with the graceful outline peculiar to that style. It is simply prepared by drawing the outline of the ornament in Indian ink, and filling up the ground, on the reverse side, with a coat of varnish or prepared wax, and when dry, passing over the whole a solution of fluoric acid; this acid acts upon the uncovered surface of the glass by eating away the face, the whole is then washed, the varnish or wax removed, and the raised surface rubbed, which produces the appearance of ground glass.

Messrs. Hoadley and Oldfield have executed several large windows in embossed glass, one of which was for Fishmongers' Hall. They occasionally combine the embossed, the stained, and the enamelled process, upon one surface. This they have introduced, with particular effect, in a pair of blinds at their own residence, which are fixed in folding frames to their parlour windows, and hung on hinges in the usual way.

Gerish's Patent Spring Hinge.

This is a very ingeniously contrived door spring; it simply consists of a common butt hinge with a spiral spring enclosed in an iron tube, on the principle of the steelyard, projecting at right-angles to one of the sides or leaves of the hinge, to which is attached a strong chain connected also to the opposite leaf of the hinge; this tube is either let into the door-post or jamb of the door, and otherwise fixed in the usual way; the action is obvious, that upon opening the door, the chain is drawn out and extends the spiral spring, which immediately collapses, upon the force being withdrawn, and the door closing.

The annexed engraving will show it more clearly:—



A is the butt-hinge, B the chain, and C the tube, enclosing the spiral spring. This spring hinge can be attached to any door, and either fixed in the centre between the common hinge, or in place of either of them. The cost is comparatively trifling, being about three or four shillings for the usual sized door, one of which will be sufficient; but for large doors two would be required. They are also made of brass for best rooms, and have a very neat appearance.

ON PREJUDICE AS TO STYLE IN ARCHITECTURE.

Read before the Architectural Society, on Tuesday, January 30, 1838, by William Wallen, Esq., Member.

There are few subjects of inquiry more interesting to the architect, than that relating to the prejudices of its several professors in favour of the adoption of a particular style, to the exclusion of every other. While some are unwilling to allow that the attributes of harmony and beauty are to be found beyond the pale of Grecian art, others as pertinaciously contend, that in the Romans only can we find perfection, whether considered with reference to admirable construction or appropriate decoration. A third class turns a gangrened eye towards the beauties of whatever is still classic, and can only allow of excellence in the creations of a Palladio, a Scamozzi, a Bramante, or a Serlio, who, though reviving the architecture of ancient Rome, appended to it certain features and proportions peculiarly the offspring of their own minds; nor is a fourth class wanting, to whose members the architecture of the middle ages appears decked in all the attributes of grace and elegance in these respects outvying all other styles. The several abettors of such an unwarrantable addition to a particular style, would (with equal reason) declare, that "the rose is a beautiful flower, but as the lily is not *like* the rose, it is ugly." It will be no difficult matter to show that this unhappy perversion has swayed alike the mind of the mere tyro and that of the most consummate master of the art; that it belongs to no particular period—that it results from ignorance of those styles of architecture which are decried, and is injurious to the best interests of the art, while it impedes the progress of the individual professor. The object of this brief essay is to point out some of the inherent beauties of each style of architecture, and to prove that none are deserving of utter condemnation, except when introduced by the mere copyist, who designs without the least regard to historical propriety, and therefore, by the misapplication of the means at his disposal, too frequently brings derision on the style adopted, whereas it should only apply to the incongruous production foisted upon his employers.

It will, doubtless, occur to the minds of many present, that there have been particular attachments in the public mind to certain styles of the art at particular periods. It is natural, indeed, that such should have been the case. At the dissolution of the religious houses, a degree of dislike was entertained for the style in which the architects of the middle ages had erected the various structures appropriated to Roman Catholic worship; and it was very difficult, at this period, to prevent an incongruous admixture of the revived architecture of Rome with the declining Gothic; indeed, the amalgamation of the two styles by contemporary architects was natural, and therefore defensible, although by no means to be imitated.

When the classic style had obtained more serious study, and when the treasures of ancient Rome were disclosed to the eye of the admiring

student, it was natural that the productions of the middle ages should be permitted to dwindle into obscurity; and that when spoken of, they should be spoken of in terms of depreciation. It was, indeed, natural that Roman art should be elevated to the disparagement of every other, when Roman art *alone* was presented to the contemplation of the architectural professor. As yet Grecian architecture was unknown, and Athens (the seat of excellence in the various arts of civilized life) was supposed to have been utterly destroyed, and its architecture for ever lost. No sooner, however, did the productions of Stuart and Revett remove this impression, than a striking change occurred, and to be *Greek*, and *Greek only*, was the aspiration of the tyro and the boast of the titled professor. Once more the Gothic was introduced, nor were those wanting who upheld its thousand excellences; thus has the taste of the public fluctuated from the sixteenth century until the present moment, and when it has not suited it to be Grecian it has been furious Gothic.

Civil architecture must ever be regarded as the handmaiden of history, and the various styles which it embraces are indicative of the habits, the customs, and local necessities of those with whom they originated. As mankind was originally one family, speaking one common language, but being now distributed over the face of the globe, are found to vary in their language and the habitudes of life. So architecture, in its primitive state, was confined to one style, and by the dispersion of the human race, changes and alterations were gradually introduced, as they were called for by the nature of the climate, the customs of the people, or the materials at hand for the purposes of construction or decoration.

The dissimilarity observable in the various styles of architecture (when studied attentively) does not appear more remarkable than that which exists between the form of the rude Hottentot and of the beautiful Gorgian—between the inhabitants of the cheerless regions of the North and that of the genial atmosphere of the South. No architect can be judged able to pass a correct opinion upon the beauties or defects of either the Egyptian, Grecian, Roman, or Gothic style, who has not carefully and maturely studied the history of the several nations from whom their styles have emanated, since the history of architecture constitutes an essential part of the history of mankind.

It is to no purpose that we servilely copy the unfading excellencies of Greece and Italy, whilst our minds remain unimpressed by the local or other circumstances which called them forth,—it is to no purpose that we measure and delineate the ruins of Athens and Rome, unless we are able to trace up to their causes the effects which we see produced—effects which will never be found to have arisen from chance or fortuitous circumstances—clearly proving that there were certain principles acted upon, and that we must become thoroughly acquainted with these principles, ere we can hope to rival that which we admire. Copyism is not imitation, and we can only imitate correctly when the feelings of the original architect have been transferred to our own minds.

No one who is critically acquainted with the various styles of architecture but will accord to each its inherent beauties and defects, which, derived as they are from peculiar local, or other circumstances, should not be unconditionally deprecated or upheld. The Egyptian style, although singularly appropriate in the country in which it was brought to perfection, is (in a great measure) unsuited to our northern climate, and the more when stript of its various hieroglyphic and other ornaments; which, unmeaning as would be their introduction here, were of essential importance in Egypt in denoting the purpose and destination of the buildings to which they ware attached. Scarcely any structure of ancient times is deficient in that most important particular—the appearance of suitableness to its proposed destination; and it is to this circumstance that we must ascribe the revulsion of feeling which is experienced when we see these structures servilely copied, or their decorations introduced where they are wholly inapplicable. We have to lament that in modern times no attention is paid to the destination of our national structures, we erect incongruous masses of brick and stone for our sovereigns—Corinthian palaces for our veterans—structures replete with comfort and convenience for our remorseless criminals, and bastiles for our virtuous and suffering poor!

Of the structures of Egypt it will be unnecessary to speak further; but Egypt does not possess the ruin of a single building which did not originally furnish an adequate reason for its existence, and afford indubitable evidence of a great and scientific people.

It has frequently been asserted that Egypt merely evinced the infancy of Architecture, and that to Greece alone must be ascribed the merit of rendering it worthy the title of a regular science. This assertion comes to us supported by evidence, and in order to discover its fallacy we need but turn to the works of Denon and Desgarnaux, in which, so far as geometry or perspective delineation could convey to the mind a correct idea of the originals, we at once perceive the clearest proofs of scientific arrangement and tasteful and appropriate ornament.

Much praise has been claimed for the Grecian architect, for introducing the Entasis, or swelling of the column, in order to overcome an optical illusion. It is not, perhaps, generally known, that in the monolith or obelisk removed from Luxor to Paris, the same peculiar foresight is observable, nor is it generally known that in the various gigantic figures introduced as bas-reliefs on the structures of Egypt, the parts removed farthest from the eye have been sculptured out of proportion in order to counteract the effect of distance. These circumstances alone will prove that the architectural ruins of Egypt are the production of men of science, and we may add the Hundred Gates, Thebes, the stupendous Enclim of Memphis and Apollonopolis, cannot, even by the most prejudiced, be considered as the offspring of infantile minds.

The simplicity, elegance, and grandeur of the Grecian style are so evident, and force themselves with such power upon the mind, that we must pause, ere we express surprise that practising architects should uphold all that is Grecian as beautiful, "*per se*," just as we should hesitate to condemn the enthusiasm of the amateur, who is ready to admire whatever has proceeded from the pencil of a Raphael, a Rubens or a Titian. And yet there has been and are lapses of beauty and propriety observable in the efforts of the most illustrious of every art, which only shows how important it is to ascertain first principles, and then to form our judgment of the merits of each production by the unerring data which they furnish. It had been well if some of the productions of a Raphael had been unknown beyond the studio; it had been well if the vagaries of a Callecrates and a Ninesicles, had never been incorporated in the eternal marble.

The principal complaint to be urged against those architects who possess the Græco mania, is that they copy and *merely* copy the excellencies before them, without considering the peculiar circumstances which regulated the mind of the original architect. What propriety is there in applying the panathensic procession, attached to the Parthenon at Athens, to a modern club-house, or a park screen; it must be admitted that the application is unwarrantable, and to be lamented (and the more especially in the latter case), as its immediate proxity to the residence of the greatest military hero of modern times, and no less to the statue designed to commemorate his victories, would rather have warranted the representation of some subject connected with the glories of Waterloo, than that of a religious procession designed to commemorate the reverence of the Athenians for the worship of the heathen goddess Minerva.

In speaking of the altered character of the Greek nation, Lord Byron has observed,

> "They have the Pyrrie dance 'tis true,
> But where's the Pyrric phalanx gone?"

Some may say, with truth, that in the productions of the *imitators* of Grecian art, we have the substance presented to us instead of the shadow, and that we nowhere discover the feeling (breathing as it were through the marble) which was infused into the minds of the architects of ancient Greece. No! of this beautiful style we must yet say, "Its country is Greece—its throne the Acropolis of Athens."

But there have not been wanting those who altogether decry the beauty of the Grecian style, and among others, Sir William Chambers unhesitatingly asserts that the Parthenon is much inferior to St. Martin's Church; and as a set off to this assertion of the *first* regius professor of architecture, the gentleman who now holds that important office, has asserted with equal force that St. Martin's is an abortion, that it is neither Grecian nor Roman, but Vitruvian, as distinguished from both, and that Vitruvius himself is a plagiarist and a pretender! What are we to say of such assertions, but that they are the emanations of minds biassed in judgment and closed against the reception of the truth.

The circumstances under which this essay has been prepared preclude the possibility of continuing further remarks to prove that the like unhappy prejudices subsist with respect to the Roman, Italian, and Gothic styles. Inigo Jones, in the *worst taste*, attached a Corinthian portico to old St. Paul's—the work of Gothic architects—simply because he *hated* that style. Such an amalgamation is not more incongruous and repulsive to good taste than the union of the beauteous form of woman to that of a piscatory monster. Again, it may be noticed that Sir C. Wren reviled the Gothic style, and has left us the proof of his utter ignorance of what he condemned, in the unsightly towers of Westminster Abbey, and the ridiculous details of St. Dunstan's in the West, where we have the acanthus leaf foisted upon us in the beautiful and appropriate crocket and terminal of heterogeneous vegetation instead of the graceful finial.

When we see such men as Sir Christopher Wren, Inigo Jones, and Sir W. Chambers, tainted with such unhappy prejudices, and consider that it does not fall to the lot of the architect always to select that style of architecture to which he is personally attached; and that, conse-

quently, where a different style is required, nothing but an intimate acquaintance into that which is selected will enable him to do justice even to his own professional character or meet the expectation of his employers, it must be evidently the duty of the professional man to study each style with care and attention. This can only be done with advantage when every effort is made to render the mind conversant with the history of the people from whom each style has descended to posterity—and this being done, the "ponderous and heavy Egyptian style"—the "tame and feeble Grecian"—the "meretricious Roman"—the "rude Saxon"—the "ponderous Norman," and the "unsightly Gothic," will be terms only found to be used by the ignorant pretender.

THE NECESSITY OF A NATIONAL SCHOOL OF ARCHITECTURE.

Read before the Architectural Society, on Tuesday, February 13th, 1838, by John Blyth, Esq., *Member.*

The interests of architecture are so intimately connected with the qualifications of those who follow it as a profession, and professional qualifications are so much influenced by previous modes of study, and by early prepossessions and prejudices, that I propose in this paper to inquire how far architecture suffers from the want of some methodical and recognised system of instruction preparatory to an individual exercising the important functions of a professional architect;—in other words, I intend to point out the necessity there exists of a British School of Architecture.

In doing this, I am fully aware that I undertake an invidious task, and may probably be considered somewhat presumptuous; but as the main object which I have in view is to impress upon this Society (one of whose professed objects is to originate such a school) the almost universal prevalence in this country of defective training, I trust that my remarks will be received in a spirit of candour and forbearance.

Although it is true we have a Royal Academy, which professes to provide for and maintain a school of architecture, in common with a school of painting and sculpture, I am confident there is no one acquainted with the system and the discipline pursued in that school who would venture to contend that, in a strictly architectural sense, it deserves that name.

There are, indeed, periodical exhibitions and prizes, a tolerable library, and occasional lectures; but as to any superintending care which the Royal Academy exercises over the students, *that* is quite out of the question, and I believe I am justified in stating, that the watchfulness of the council over its school of architecture was so incessant, that for several years together the students were not gratified with either the sight of a professor, or the sound of a lecture.

And even as to the lectures themselves, it cannot be expected they will ever become what a course of lectures on architecture ought strictly to be; that is to say, not merely a history of the origin and progress of the art, and an elucidation of the general principles of design; but a full description of the science of construction, the quality and uses of materials, together with instructions upon geometry and mensuration, and an exposition of architectural jurisprudence as it exists in statues, precedents, and practice.

In the lecture-room of the Royal Academy any such minuteness of particulars would become extremely unpopular. Addressed as the lectures are to a promiscuous auditory of painters, sculptors, engravers, and architects, and having for their main object the illustration of such parts of architecture as may be serviceable to the *collective* assembly, it follows that the historical and decorative branches of the art being those only that may be considered of practical use to the painter and sculptor, the lecturer is under the necessity, from the unfavourable circumstances in which he is placed, of accommodating himself to his audience, of suiting the supply to the demand, and, in short, of rendering his discourses as popular as possible both in their quality and quantity.

They are made, in fact, to be to the painter, what the lectures upon anatomy are designed to be, that is, as much as and no more than is required to serve a special purpose; and from what I know of the architectural lectures (clever as many of them are), I should say, without hesitation, that at the Royal Academy an architect might as well hope to learn the arcana of his art from the lips of the professor of architecture, as a medical pupil would expect at the Academy to acquire an adequate knowledge of anatomy from the eloquent and popular lectures of Mr. Green.

Another great defect to be noticed in the Royal Academy is the want of a suitable museum and gallery, supplied with the best description of models, specimens, casts, and drawings. The science of construction is of the first importance, but in the Academy the student has no guide; practical details form no portion of his studies; his works, not uncommonly, are judged of, not by the real standard of excellence, purity, propriety, and practicability of execution, but by their power of pleasing the fancy. It is thus that young architects, knowing their designs will for the most part be judged of by artists, not unfrequently aim at producing pictorial and picturesque effects, a course wholly incompatible with an attainment to that severe, chaste, and correct style which ought invariably to precede an indulgence in what may be termed the excursive and speculative style.

How shall we otherwise account for the great number of impracticable, incongruous, and clap-trap designs which are not only admitted within the walls of the Academy, but to the exclusion of others of sterling merit—and for the acknowledged fact, that inferior designs have obtained the first prizes which the council had the power of awarding?

Constituted as the council now is, it is too much to hope that matters will materially improve. Composed for the most part of painters, who, proud however as we may be of them as painters, we cannot bring ourselves to believe are competent judges respecting the merits of architectural performances, and the proper rank and claims of architecture, until architects are appointed the sole adjudicators, or altogether a separate school is established, their decisions cannot be relied on, or expected to give general satisfaction.

Inadequate as are the means of the Royal Academy for initiating and grounding young men in the theory and practice of classic architecture, to say nothing of Gothic architecture, which it virtually degrades by an entire exclusion from its system of instruction, it would be unjust to deny it altogether any merit or value; and it would be ungenerous and ungrateful in me, as a quondam student, who, in common with others of this Society, have reaped some advantage from being connected with it, not to acknowledge my obligations. Nor ought it to be concealed, that since the establishment of the Academy, the interests of architecture have been greatly benefited by the taste that has partially been diffused among the people by means of the annual exhibition, and the emulation which it has excited among the junior members of the profession. But as I am now speaking of systems and principles exclusively, truth compels me to affirm, that, as compared with the schools of France and other countries, the Royal Academy falls lamentably short of what a National Institute might become, and ought to be.

In short, the discouraging and rambling way in which architects are now a-days compelled to obtain the qualifications essential to their future success, partly in an office, partly in the Academy, partly in the British Museum, and partly in some society or institute, constitutes a case that calls most loudly for redress.

For what is the result of this state of things? The consequence is, that real merit is either depressed, or remains in obscurity. The public taste continues at a low ebb; the well-stored architect is supplanted by the ignorant and boasting pretender; the profession is humbled, and art is degraded; numerous edifices, which might otherwise have become the means of proclaiming to after ages the wealth, refinement, and magnificence of the nation, will only become the objects of ridicule and contempt.

At present the public are frequently at the mercy of chance, with respect to the qualification of individuals who become appointed architects over important works. The system of advertisement competitions brings into the field a host of adventurers, whose abilities are rarely inquired into, provided they have produced a cheap and gaudy design, and have the name of architect duly inscribed on a brass plate or card.

It not unfrequently happens, in competition concerns, that the architect's estimate, either by artifice or from carelessness, is made to tally exactly with the state of the exchequer. But when the day of trial comes, the lowest tender is found to be half as much again as the sum anticipated. What is to be done under such circumstances? An honourable man would either retreat, in order to do justice to those who were associated with him in the competition, or he would candidly inform his employers that his designs were impracticable below a specific sum. This, however, is a course not frequently taken. The architect has attained his object. He holds the appointment, and intends to retain it. Although he has misled his employers, he now knows their every wish; and it is only for him to pare and shave the walls and timbers of his buildings, and their views may be carried into effect for the sum of money at command.

The process is easy and simple. His two and a half brick walls are reduced to one and a half, with or without piers. It is found that a saving of twenty per cent. may be effected upon the timber and lead work; and as for the foundation, instead of going to the depth his first designs contemplated, it is now discovered that a little rubbish and hot lime, nicknamed concrete, will suit the worst case in point of foundation. Fresh tenders are received; the result is delightful. The whole can be done for the money in hand. The work goes on gaily to the last finishing stroke; every thing wears a promising aspect. The architect, if he should not have entailed a heavy amount of extras, receives his commission, and is dismissed with compliments. Next comes the upholsterer to load the building with furniture, and then the occupants to fill it with company. Up to a certain time nothing serious may be visible; but at length the costly papering, the gilt cornices and painted ceilings, begin to crack. The doors and sashes betray symptoms of disorder. The attic story, in wet weather, is like a dripping well; the floors form segments of circles, and the walls are found to have deviated from the perpendicular. An examination takes place—the murder is out! Our competition architect, for the sake of a temporary advantage, has had the temerity to construct, not by rule, but upon experiment—not upon a medium, but a minimum principle of strength. This is not an imaginary case; and such occurrences will continue to be repeated, until steps are taken by the legislature to promote the study of architecture by proper modes of instruction, and by granting certificates to those only who are qualified in strict accordance with the system that may be adopted. If people were then to persist in holding out a premium upon incompetency, as so many do upon quackery, the odium which now rests upon the profession in general would not be fixed upon the legalized body of architects, but upon ignorant pretenders, and those who should be foolish enough to become the dupes of their artifices and professions.

Competition cannot be too strongly advocated when under the direction of qualified and impartial judges, equally willing and able to give that design the preference which has the most merit. Competitions of this kind are the principal means of eliciting latent talent, and of giving encouragement and scope to younger architects, many of whom from their energy, enthusiasm, and comparative leisure, are pre-eminently qualified to prepare ela-

borate and well-digested compositions. This, however, is a state of things which so rarely happens, that it may be taken much rather for an exception than a rule. Committees and Commissioners, although honourable and well-intentioned, have, for the most part, a task imposed upon them beyond their capacity to execute, when they have to decide upon the respective merits of an architectural design; hence they frequently become the unconscious instrument of mischief and injustice, and the dupes of interlopers who have imposed upon them by the meretricious appliances of colours, landscape, and figures which some artist has executed for them apparently to conceal the deformities of their own part of the performance.

Without presuming to offer an opinion with respect to the question at issue between the Commissioners and those who competed for the honour of superintending the New Houses of Parliament, or without intending to convey the idea that inferior talent was arrayed against Mr. Barry, it cannot, I think, but be a source of satisfaction, that the work is confided to an architect whose intimate acquaintance with the principles of Gothic architecture is a guarantee that his design, when executed, will reflect deserved credit upon himself, and lasting honour upon the nation for whom he has the high and enviable honour of acting.

Under the heap of abuse and contempt which the commissioners have laboured, it is a most fortunate circumstance for them that there are few, if any, who will deny to Mr. Barry the possession of great abilities and competency in his profession. At the same time I think it would have been politic to have allowed the whole of the architects who sent in designs to have expressed their joint opinions by the result of a ballot, and thus the commissioners might have exempted themselves from the charge of partiality and incompetence as judges.

For the purpose of qualifying a youth to be an architect, there are many persons who imagine that nothing more is required than to place him with a professional man. This, however, is a mistake that cannot be too strenuously exposed. The course of study pursued in an architect's office, if that can be denominated study which consists in copying and transcribing, is quite inadequate to the end in view. In order to make myself better understood, I will detail a case or two from every day observation.

A youth enters an office; it may be his master has but little real business; it may be he has much. In the former instance, if he be a competent and conscientious man, he will endeavour to make up to his pupil in theoretic what he is not able to give him in practical instruction; but after all that, the pupil will be but partially and incompletely qualified. Should, however, his master be possessed of neither knowledge nor a sense of duty, the youth will be left to his own resources. The probability is, that his time will be spent in desultory reading and drawing; his acquirements will amount to nothing but a chaos of scraps and fragments; and finding himself incapable of producing anything worthy of notice, a study which, under auspicious circumstances, would have proved delightful and engrossing, becomes at length uninteresting and irksome.

On the other hand, a youth may enter an office in which there is much occupation. Here there is nought but bustle and activity. He copies drawings and specifications of works, and, by good fortune, has the privilege of watching the progress of their execution. Under such circumstances as these there is much to improve, encourage, and stimulate the architectural tyro. But unless hours of patient study in the morning or evening are superadded to those spent in the day-time at office, and in an assiduous application to the writings and designs of the best authors, our student will become little better than a mere mechanical architect. Unless his mind be stored with ideas, and a quick perception of simplicity, harmony, beauty, magnificence, and sublimity; unless the lineaments and features of architectural grandeur and grace are deeply impressed upon his memory, he will have no ready invention, no powers of skilful combination, and we fear but little enthusiasm.

The object of an architect in practice is not to convert his office into a school, but to transact business; not to design imaginary palaces, when he can be employed upon real buildings; in fact, not to build "*in nubibus*," when he can do so on "*terra firma*." Hence it is, that in an office of business there is little time allowed for original efforts, and for the exercise of a student's own faculties of invention.

We observe, further, that there is frequently a difficulty in obtaining a comprehensive knowledge of the different styles of architecture. Many architects have their favourite style, and sometimes to the exclusion of the rest. One gives the preference to Grecian architecture, another to Roman architecture, a third to Gothic architecture, and a fourth to Pictorial architecture. Each aims at practising in that style which he knows he most excels in, and of recommending it whenever and wherever he can. This, in my opinion, is a great evil, and exerts a most pernicious influence upon the rising generation of architects. It tends to create prejudiced opinions; and to establish in the mind a vitiated bias highly injurious to the interests of art.

It was this partial taste which led Sir Christopher Wren to throw discredit upon a style which disgraced not him, but which he disgraced; and the numerous mongrel edifices, which circumstances have thrown in the way of some of our oblique-visioned architects, who, although they condemn a style, do not, for the sake of profit, refuse to burlesque it, attest the baneful consequences of this tyrannical and absurd prejudice.

In some of our architects' offices also, the study of the economic style of architecture has been carried to such an extent, as to set at defiance all the laws of construction; and we fear that public attention will not be awakened to a proper sense of this ill-judged parsimony, till the untimely decay, dilapidation, and downfal of some of our public as well as private works force upon the nation a conviction, that the best and truest economy is to build, in the first instance, under the direction of scientific men, and with a due regard to the solidity and permanence of the structure.

We believe, that even under the most favourable circumstances possible, an architect's office *per se* is not sufficient to qualify for practice. I do not wish to underrate the advantages of an architect's office—in them is to be learnt what elsewhere could never be acquired; and if the best school in Europe was to be formed in this country, I am sure it would not supersede the necessity of office experience; but when we see the mixed character which I have described as prevailing among architects, I think I may safely say, speaking in general terms, that offices of themselves are decidedly inadequate to form a class of accomplished architects; and I might appeal with certainty to every architect in this room, to confirm me in the declaration, that if they had relied for all their information upon the office in which they were respectively placed, and had not been animated by a motive to see and search for themselves, they would not have found themselves fitted to exercise their professional functions with becoming satisfaction or confidence.

It is truly astounding, that the British Government should, not long ago, have interested itself in the formation of an institution, having for its object the interests of architecture, and the protection of the public. But so it is.

Dr. Hogg, in his interesting work, "London as it is," observes—"While in foreign states the government acts as the true guardians of the people, superintending their education, encouraging talent and industry, protecting their health and ministering to their wants and necessities, England, *as a nation*, has comparatively done nothing. The example of France and Prussia has been long before our eyes, but no advantage has been taken of it."

"Many of our national improvements have been promoted more by private individuals than by the Government. The formation of roads and railroads, the construction of docks and canals, the establishment of cemeteries and slaughterhouses; these and other triumphs of science and art, have been achieved without Government (having an annual revenue of fifty millions sterling) contributing one sixpence towards those undertakings; whereas in Germany, France, and other countries, the projectors would have been raised to independence, and ranked among the nobles of the land."

It is the apathy and indifference of the Government and of the Royal Academy to the interests of architecture, which have led to the establishment of the Architectural Society of London in the first instance, and subsequently to that of the Royal Institute of British Architects; and, although we are not so sanguine as to expect that the extensive benefits which they contemplate will be immediately realized, we believe, that in furtherance of a British school of architecture, this Society has been the means of laying a foundation broader and deeper than was ever before laid in this country; —and as the attention of Her Majesty and the nobility has been called to the state of architecture in this country by the Institute of British Architects, we hope, that shortly there will arise a school producing a race of architects, whose names and works shall be as lasting as those of Italy and Greece.

SOCIETY FOR PROMOTING PRACTICAL DESIGN, &c.

Having spoken rather fully of the pamphlet containing an account of its Inaugural Meeting, we shall now be more brief in our mention of this Society than we should otherwise consider it our duty to be. Its aim is most patriotic and praiseworthy, and it is calculated to effect much good both directly and indirectly, and ultimately to raise the taste of the public far beyond its present level. Its efficiency must, however, in a great measure depend upon the readiness of the public to encourage and second its efforts, for the most zealous and spirited individuals will be able to accomplish little if thwarted by the apathy of those to whom they look forward as co operators, in an undertaking which can be carried on successfully only by the diligence and perseverance of many.

At present, as regards our manufacturers and the productions of our artisans, there is no other standard of taste than fashion and expensiveness. By mere accident, the fashion of to-day may happen to be better than usual, but to morrow it may be totally changed for something as bad as ever. Let us look at one species of manufacture which depends entirely upon design and the taste shown in the selection and combination of colours; what can be, for the greater part, more inelegant, or even vulgar, than the papers used for hanging rooms. We are not speaking of exceedingly costly ones, or those which are prepared by professed *decorators*, but of such as are brought into the general market, and used for the rooms of ordinary dwelling houses. However inferior they may be in regard to quality and splendour, they might, without becoming at all more expensive, be in infinitely better taste, so as always to be pleasing to the eye, after they had ceased to be in the very latest fashion. On the other, as a striking proof that very great improvement of appearance has been actually effected of late years without any increase of price, we have only to point to the embellished wrappers of many publications which are brought out in parts, or sold done up in thin covers. Although they are designed to be merely temporary, the borders, vignettes, and other decorations on some of these are in a style that some years back, when a mere piece of blue paper was thought quite sufficient for the same purpose, would have been considered prodigies as specimens of such embellishments, perhaps very prodigal also. There is no reason why similar improvement should not take place in every other production of industry and manufacture, and we hope that all obstacles in the way of such improvement will be speedily removed. At all events, the Society will do what they can to promote the kind of improvement so greatly to be desired; it remains for the public to determine whether their meritorious efforts shall be crowned with success.

OBSERVATIONS ON LOCOMOTIVE AND STATIONARY ENGINES.

Remarks on the Report of Messrs. Stephenson and G. P. Bidder to the London Grand Junction Railway Company.

By an Old Engineer.

Sir,—I perceive that Messrs. Stephenson and Bidder, have, in a report to the directors of the London Grand Junction Railway Company, recommended the same mode of working that line, which they had advised in the case of the Blackwall Railway. This system is in my opinion, so utterly absurd and ill advised, that, in a desire to avert from the shareholders and the public the consequences of this most rash project, I request the insertion of a second letter on this subject in your Journal.

Messrs. Stephenson and Bidder still recommend the *tail* rope in preference to the endless rope, and their reasons for so doing are thus explained :—

"We would also remark, that the application of stationary engines to your line of railway can hardly be considered an experiment, as on the London and Birmingham Railway the rope is nearly as long as it will require to be on your own line; for although the carriages are drawn by the stationary engines only one mile on the former, yet, being attached to an endless rope, instead of a tail rope (as would be the case on the London Grand Junction Railway), the rope is necessarily two miles long, whereas the ropes proposed to be adopted on your railway are only two miles and a half long, being half a mile longer, which difference is compensated by your line being straighter, and not having inclinations so steep as on the Euston Square extension."

It must be borne in mind that this paragraph has allusion to the double line of rails, each of which lines, according to the terms of the report, are to be kept in action, in order to start the trains every quarter of an hour from each end; so that for the purpose of working the line, a rope four times the length of the line, ten miles long, must be kept in motion; thus making the length of active rope exactly the same as if it were an endless rope, or five miles long, and the two tail ropes will be each two miles and a half, or five miles jointly. The rope between the train and engine must be coiled up, or around a drum or cylinder, as the train advances, and the tail must unwind at the same rate; and, unless some provision is made to meet the difficulty, the rope coiling over itself will increase the leverage upon the engine. If the line was made to slope towards each terminus, a compensation might thus be made in favour of the engine as the rope coils upon the cylinder, and this would meet the case both ways; but this does not coincide with the principles laid down, for the gradients to follow the line of the soil. The only method left will be some mechanical arrangement in the gearing connected with the engines, which will be necessarily complex in itself, and matter of much cost in the first instance. It is therefore evident that a just view has not been taken of this point of the subject, for had an endless rope been employed, it would only have been necessary that it should have been double the length of the line, or five miles long for two lines of rails, whereas, by the tail rope being used in preference, it must be necessarily double the length, as observed above. Thus there is a double friction in the uncoiling of the tail over two loose pullies, instead of one, as in the case of the endless rope. The credit, therefore, for economy, in this instance, is placed to the wrong side of the account.

I observe, in corroboration of my view of the case, expressed in my former letter, that Messrs. Stephenson and Bidder admit the fewer the stations the better for their system; but the fact is, unless they adopt a higher velocity than that proposed in their report (twenty miles per hour), they cannot, with even one station, accomplish the distance in the time they propose. Twenty miles per hour is one mile in three minutes; two miles and a half will, therefore, occupy seven minutes and a half; allowing, then, one minute and a half for gaining and losing the velocity at each terminus, is nine minutes, one minute and a half at King's Cross, for stopping and starting the velocity, and one minute for taking up and putting down passengers, will be eleven minutes and a half; then, unless the maximum velocity be increased to thirty-seven miles and a half per hour, or 1.6 miles per minute, the object cannot be effected, of performing the entire journey in eight minutes, because the loss of four minutes must in all cases take place; and, in fact, increases proportionally as the maximum velocity is increased.

It is made matter of congratulation, "that the traffic is more regular, and does not come in such gluts as may be expected upon the Blackwall line; consequently the trains will be more equalised, and more uniform in load." But, with a view to economy of construction, they destroy the levels and follow the line of the soil, leaving just headway enough to cover the regulations for crossing the streets, converting the line into a series of undulations, and thus making the load upon the engine a matter of perpetual variation; at one moment being required to drag the train up an excessive inclination, and at another, the train will plunge down a corresponding inclination, requiring the utmost exertion of the brake to prevent its attaining a dangerous velocity; and then the surge which will take place when the power of the engine, at the top of its speed, is again applied to the train, will be such as very likely to snap the rope, and will produce such a shock as will be, in the worst sense of the word, offensive to the passengers.

The observation is very true, that the shorter the line, the better adapted for the application of their system; but for the purpose of rapid locomotion, every line is too long, to which it would be possible without objection to apply the stationary engine system in a mechanical sense; but the defects of the system, as a dangerous one, are such, that it ought to be made, in my opinion, for the purposes of a passenger traffic, a case of utter prohibition.

The gradients of the Birmingham line average sixteen feet per mile; so that the gradient upon this line being only fifteen feet per mile, are more favourable for locomotive than upon the former line, excepting a short gradient of nineteen feet, which would not affect an engine coming upon it with velocity, more particularly as this line would be, for the most part, a passenger line, and the trains light.

I think I clearly proved, in my former letter, that, for all the purposes of a railway, the locomotive is more under command, susceptible to a higher degree of adaptation to the curves, beyond comparison safer, and for the purpose of drawing up accurately to the intermediate stations, no comparison is admissible. How do Messrs. Stephenson and Bidder provide for the case of the engineer missing his mark—by a few turns of the great cylinder, which would make a difference of perhaps 100 yards or more in the point of the trains stopping? How are the passengers at the station at King's Cross to adapt their individual velocity to this accident? Are the old ladies and the fat gentlemen to run for it, or wait for a better hit next time. This would never happen with the locomotive, for it draws up to a point with as much precision as a stage coach.

Account is taken for the London fogs to form an argument in favour of their system; this, indeed, gives a foggy character to their view of the case; it is a well known fact, that an engine always gets through its work better upon a wet day than a dry one, provided the rails are not muddy, as they never can be upon a viaduct; it is true, the wheels skid more, but what is lost in the adhesion of the wheels of the engine is very much more than counter balanced in the reduced friction in the wheels of the carriages. This is a fact so well known to every engine driver, that I am astonished Messrs. Stephenson and Bidder have ventured the statement, unless they calculate upon the heads of the directors being so foggy, that any argument, however *slippery*, will pass without being called in question.

The estimate of cost for the stationary engines is limited to one engine at each end of the line, whereas it is found, upon the Liverpool line, and upon the Birmingham line, essential that there should be provided duplicate engines as a provision against accidents; where, then, is the justice of the comparative estimates in this case?

The nuisance of ashes, &c., from a locomotive (if any exist), is chargeable, as stated in my former letter, to misarrangement; the pullies, supposing them to be eighteen inches in diameter (larger than those upon the Birmingham line), when the rope is travelling at the rate of twenty miles per hour, will revolve 370 times per minute; I therefore allow this fact to speak for itself, as regards the quietness of the system.

In the case of the locomotive system, if it be required, on account of a sudden increase of traffic, to increase the means of transport, it is only necessary to place upon the line more locomotives and carriages, these travelling at the same velocity as upon other occasions; and then the expense of engines, &c., and the consumption of fuel, is proportional with the traffic, and paid for by the occasion calling it forth; and when not needed, the engines are idle and non consumers; but in the stationary engine, Messrs. Stephenson and Bidder admit, to meet such a demand, which may perhaps only occur upon some fair or holyday once or twice during the year, they would need more powerful engines, which must consequently, upon every other excepting extreme occasions, work at a loss; and they can only meet the demand by an increase of velocity in the train itself, to perform the distance in eight minutes; I have shown it will be necessary to employ an average velocity of thirty-seven miles and a half per hour; how ridiculous to say that they will, in the case of the traffic doubling, which may be expected on Sundays, that they will produce a velocity of double, or seventy five miles per hour; and the case is no better if they double the load, for then during the week they will be throwing away half the power of their engines.

The suggestion of a single line of rails comes in very well as a last argument, for it is so very thin in reason, that for such a line the directors themselves must perceive it to be perfectly visionary.

It is a fact generally known, that the Whitstable and Canterbury Railway, of *five* miles long, worked by fixed engines, has been let to contractors who are about abolishing all the engines upon the line, excepting one, and to substitute locomotives. This railway was made by Mr. George Stephenson, and the average time for performing the journey *now*, is forty minutes. It is to be hoped, therefore, that his experience has been since so far improved as to insure to the directors of the Grand Junction Railway there shall be no mistake *this time*.

The discussion instituted by the directors of the Liverpool and Manchester Railway Company, to determine which system of working their line was most eligible, has supplied a valuable body of evidence in the reports of Messrs. Walker and Rastrick, and subsequently of Messrs. Stephenson and Locke. These reports are given at length in Wood's "Treatise on Railroads," to which work I refer the reader; but the following extract, giving the estimate of Messrs. Stephenson and Locke, being most important, I must introduce here :—

LOCOMOTIVE ENGINES.

The power of each engine is taken as equal to 20 tons of goods, or 30 tons gross, conveyed 90 miles, or three trips between the two places daily = 1800 tons conveyed 1 mile, at the rate of 12 miles an hour. Engine weighing under 5 tons.

Cost of one engine and tender	£600
One-fifth for spare engines and tender . . .	120
Total cost	£720

	£	s.	d.
Interest of capital, including depreciation of 720*l*., at 7½ per cent.	£54	0	0
Add annual repairs, as ascertained by actual observation on the Springwell and Darlington Railways	50	0	0
Engine man, wages 21s. per week, assistant 26*l*. per annum	80	12	0
Coals for fuel, 439 tons per annum, at 5s. 10d.	128	0	0
Grease, oil, hemp, &c.	12	0	0
Total cost of one engine, working 312 days	£324	12	0

	£	s.	d.
Each engine being calculated to take 20 tons of goods 90 miles, or 1800 tons 1 mile, and the daily traffic being estimated at 4000 tons conveyed 30 miles, or 120,000 tons 1 mile, will require 67 engines to perform the work at 324*l*. 12s. 10d. per annum, is	£21,750	19	10
Messrs. Stephenson and Locke estimate that locomotive engines are capable of conveying goods up the inclined planes, which they propose to do by assistant engines, which will perform $\frac{1}{10}$ths of the work on a level = 12 tons, and supposing each engine to make 20 journeys, or 60 miles a day, will be 216 tons. Hence $\frac{4000 \times 12}{20 \times 240}$ = 10 assistant engines, at 324*l*. 12s. 10d.	3,246	8	4
Annual cost of five water stations, at 104*l*. each	520	0	0
	£25,517	8	2

Interest of capital, and annual expenditure of locomotive engines, which, for 4000 tons, conveyed 30 miles per day, is equal to 0·164 of a penny per ton per mile.

AMOUNT OF CAPITAL FOR LOCOMOTIVE ENGINES.

	£	s.	d.
Ninety-three engines and tenders, at 600*l*.	55,800	0	0
Four water stations, at 500*l*.	2,000	0	0
Crossings at the Rainhill and Sutton inclined planes, for the assistant engines to pass from one line of road to the other	200	0	0
Total capital for locomotive engines	£58,000	0	0

STATIONARY ENGINES.

Dividing the distance into the same number of stages as Messrs. Walker and Rastrick, the following is the power calculated by Messrs. Stephenson and Locke :—

			Horse power.
One 40	horse power engine	at the tunnel	40
Three 80	ditto	on the 1½ stages, to the foot of the Rainhill plane	240
Two 50	ditto	at the foot of the two planes	100
One 48	ditto	on the level between the planes	48
Two 80	ditto	to work the two planes	160
Twelve 80	ditto	between the foot of the Sutton plane and Manchester	960
One 24	ditto	at Manchester	24
		Total horses power	1572

ESTIMATE OF THE EXPENSE OF STATIONARY ENGINES.

	£	s.	d.
One engine of 40 horse power at the tunnel	£1,800	0	0
Seventeen stations, including the two planes, with two 40 horse power each, at 4,200*l*.	71,400	0	0
Two stations at the bottom of the two planes, with two 25 horse power each, at 2,880*l*.	5,760	0	0
One station on top of planes, with two 24 horse engines, same as above	2,880	0	0
One 24 horse power engine at Manchester	1,890	0	0
Sheaves for ropes, 13,090 at 12s. each	7,854	0	0
Four sets of crossings, and turn outs at each station, 88 at 50*l*.	4,400	0	0
	£95,984	0	0

	£	s.	d.
Interest and depreciation of capital, 95,984*l*. at 6½ per cent.	6,238	19	2
Coals for engines, repairs, and working expenses	18,917	0	0
Ropes	16,136	7	10
Duplicate ropes, interest of value upon	739	4	5
Interest of capital, and annual expenditure of stationary engines	42,031	16	5

which for 4000 tons, conveyed 30 miles per day, for 312 days, is equal to 0.2694 of a penny per ton per mile.

AMOUNT OF CAPITAL FOR STATIONARY ENGINES.

	£	s.	d.
Estimated capital as before	£95,984	0	0
Ropes, &c. in use	10,727	18	0
Duplicate ropes and machinery	14,784	9	0
Capital requisite for stationary engines	£121,496	7	0

COMPARISON OF THE TWO SYSTEMS.

	Capital.			Annual expense.			Expense of taking a ton of goods one mile.
Locomotive Engines	£58,000	0	0	25,517	8	2	0.164 of a penny.
Stationary Engines	121,496	7	0	42,031	16	5	0.269
	£63,496	7	0	16,514	8	3	0.105
Locomotive System	Less.			Less.			Less.

We trust we have given a brief, and, at the same time, sufficiently explanatory account of the estimates of the two systems; and shall, therefore, leave it to the reader to draw his own conclusions. We are the more inclined to do this, from having, in 1822, advocated the superiority of the locomotive over the stationary system; and, therefore, any observations of ours might be deemed as coming from one predisposed to judge in favour of the former system.

With regard to the policy of employing one or other of these modes upon public lines of Railway, we must, however, in candour,—and we think so much due to our readers,—state, that we entirely concur with Messrs. Stephenson and Locke in opinion, "That in considering the long chain of connected power of the stationary engines, given out by so many machines, with the continual crossings of the trains from one line to the other, and subject to the government of no fewer than 150 men, whose individual attention is all requisite to preserve the communication between two of the most important towns in the kingdom, we cannot but express our decided conviction, that a system which necessarily involves, by a single accident, the stoppages of the whole, is totally unfitted for a public railway.—*Wood's Treatise on Railroads.*

This estimate, if any faith is to be placed in estimates at all, is conclusive against Messrs. Stephenson and Bidder.

I remember, in my boyish days, Mr. Bidder, who was well known as a calculating prodigy, being asked many difficult questions of arithmetic, which took myself and others some time to resolve, he stated in much less time; but when he explained the process by which he arrived at the result, it was found such, that no person would think of adopting; and it was only admissible in his case, because he knew no other method. A faculty for arithmetical calculation, and that for mechanical combination, are widely different; in the first, and Mr. Bidder's case, any method, however round about, is good, provided it gives the true solution of the question, and no permanent interests are affected by the result; but a mechanical combination can only be properly carried out by comparison with every other known and possible method to accomplish the same object. Judgment, is the grand characteristic of the mind of a great engineer, which decides between various systems, and adopts the best. It is necessary that an engineer charged with the responsibility of a great undertaking should be endowed with a mind superior to every little feeling, that he should be above patronising one system above another, excepting upon the grounds of its own merits. Ingenuity apart from discretion is more frequently mischievous than otherwise, and it is only when the imagination is held in perfect keeping by the judgment, that it ought to be trusted, particularly in cases such as these, where the property and interests of others is at stake.

Mr. Crawshay, at the general meeting of the Blackwall Railway Company, stated his experience, from his own books, of the superiority of the stationary over the locomotive engine system. The only experience Mr. Crawshay can have had upon this subject must have been in connexion with his collieries or mines, where the only carriages travelling upon his railway are coal waggons. A railway for a colliery, where the velocity is from eight to ten miles per hour, and a railway for passengers, where the velocity is twenty to thirty miles per hour, are two very different things. In the first case, the rails may be laid any how, a few jolts more or less matters not to the material carried over the line; and if a locomotive were employed, it would be very soon jolted to pieces; therefore, in this case, a fixed engine, subject to none of the shocks of the locomotive, is decidedly better, the road may be allowed to run more into neglect, and the working expense will be reduced. But in the second case, if the rails are laid in the permanent manner, essential for the convenience of the passengers, the line will be then in a state to allow of the locomotive to work upon it *at an equal advantage*, with the fixed engine; the expense of keeping the line in trim, is called for as much by the passengers as by the engine; and if it is adjusted for the one, it ought not to be wholly charged upon the other. Messrs. Stephenson and Bidder ought, therefore, in common justice, to have set this gentleman right upon this point; I have made many inquiries, but have been uniformly assured, that beyond the mere report, *no plan* of the system has been furnished by Messrs. Stephenson and Bidder to any of the parties who have adopted their suggestions. I confess I am astonished at this, that men of business should commit themselves to such a degree as to patronise a plan of which they know nothing, of which the projectors do not even offer a tangible explanation, is astonishing. I earnestly recommend all those parties interested in this discussion, to require from Messrs. Stephenson and Bidder such proofs of their methods before carrying them into effect, that they may be exonerated of the responsibility of having involved the property of their constituents in a project, which, I feel most strongly, will prove a hopeless and utter failure.

AN OLD ENGINEER.

THE WINTER PALACE, ST. PETERSBURGH.

Among the destructive fires which have occurred within the few last months, that which has consumed the Winter Palace at St. Petersburgh, and threatened also to sweep away the contiguous edifice distinguished by the name of the Hermitage, is the one which has committed the most serious and extensive devastation. This will be apparent from the description given of that extensive structure by Dr. Granville, in his work on "St. Petersburgh," which we here lay before our readers in an abridged form, and from which it will be seen that the imperial residence occupied a site upwards of ten times greater than that of our Royal Exchange.

"This great and imposing structure has a square form, three sides of which are unconnected with any other building. The north side, or that which presents its front to the Neva, is 721 feet in extent, one fourth of which line, at each extremity, projects 24 feet from the centre. It is composed of a basement story of the Ionic order, surmounted by a principal, and a second story or attic of the Corinthian order. The roof is surrounded by a light balustrade adorned with vases and statues. The Corinthian columns and pilasters placed between the windows of the principal and second story, twenty-six of which are single and six double, are thirty-five feet high. The upper entablature is interrupted in the centre and the two extremities by appropriate pediments. This may be considered as the principal, and certainly the finest elevation of the building. The granite quay in front, separating it from the river, is wider here than in any other place. The style of the Winter Palace would be called heavy, were it not that so great a mass of building requires, perhaps, less of that airiness which becomes edifices of smaller dimensions. Its architect, Rastrelli, who owed his subsequent elevation to the dignity of count to the erection of this structure belonged to that school which loved to pile one upon another the more majestic orders of architecture, frequently injuring their effect by the introduction of ornamented architraves, flower festoons, and arabesque carvings, with pediments over the windows, formed of disjointed cornices terminating in scrolls. In these extravagant designs, Rastrelli followed the perverted taste of his day. Still, as a mass, the Winter Palace is more striking than either the Tuileries, the Royal Castle at Berlin, or any of the royal palaces I have seen in Europe, excepting that at Madrid, which, though smaller, has a more imposing front. For size, the Winter Palace I believe to be superior to all these, and in internal decoration it yields to none of them.

"The great or parade staircase, which leads from the basement to the principal story by a flight of marble steps, is remarkable for its magnificence, and the grandeur of its architecture. It would be an endless task to attempt a description of the different apartments of this Palace, which occupies an area of 400,000 square feet. There are from 90 to 100 rooms, forming almost a labyrinth, through which it requires great practice to proceed. The great Banquetting Room, the Hall of St. George, and the Salle Blanche, are amongst the most striking:—the first is 180 feet by 100, lofty, and incrusted by some of the finest marble, having a row of columns at each end, and the sides decorated with attached columns of the same material; adjoining to this Banquetting Hall, is a smaller one 100 feet by 110. The Great Hall of St. George is one of the most magnificent rooms on the continent,—neither the Tuileries nor the Palace at Versailles can boast of anything like it; it is a parallelogram, 140 feet by 60, surrounded by forty fluted Corinthian columns of porphyritic marble, ranged two and two, on which rests a gallery with a gilt bronze balustrade of exquisite workmanship. The capitals also and bases are of gilt bronze.

"The Salle Blanche is nearly the same dimensions as the Hall of St. George, and runs at right angles with it, though not immediately adjoining to it; but, as its name denotes, all its decorations are white."

Mr. Rae Wilson, also, in his account of this palace, observes, "The Hall of St. George, or audience chamber for the reception of foreign ambassadors, is truly magnificent, and has a throne with a flight of eight steps leading up to it, above which are the Russian arms, superbly embroidered." The same writer concludes his description by saying, "Some idea may be entertained of the magnitude of this gorgeous palace, when it is stated that it contains about 1,000 inmates, and in the stables 2,500 horses, 584 grooms and assistants, and 600 carriages."

WHITE'S PATENT RAILWAY LINK.

Sir,—The accompanying diagrams represent a portion of a patent which I have obtained for certain improvements in the construction of railways. It consists in the application of a retaining link, to prevent the ends of the rails from separating.

Fig. 1. Fig. 2 Fig. 3.

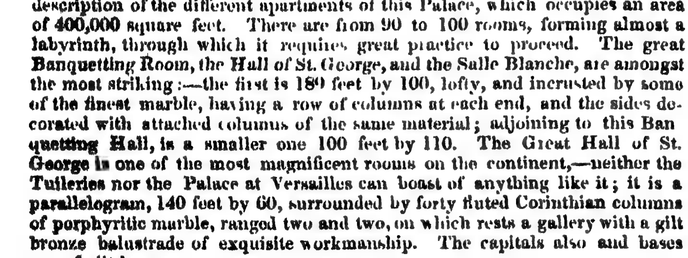


Fig. 1 is a side view of two pieces of rails as they meet in the joint chair, and shewing the retaining link in its place. Fig. 2 is a section of one of the pieces, taken through a hole which is drilled to receive one of the pins projecting from the link. The holes so formed in the ends of the rails are a little larger in diameter than the diameter of the pins, and their difference make provision for the expansion and contraction of the rails, but admit of no farther separation.

Fig. 3 is a view of the link, showing the position of the pins. The diagrams are drawn to a scale of two inches to a foot, and the transverse section, fig. 2, is a correct sketch of the 75lbs. rails which is used upon the London and Birmingham Railway.

Upon the Liverpool and Manchester Railway I have measured, in some places, rails of this description, separated in the joint chair to the extent of an inch and a quarter. Probably, when the wedges are loose, the traction of the wheels drive them backwards, as the carriages progress forward. But whatever be the cause, such gaps exist, to the serious deterioration of the engines and carriages which run upon the railway. Yours, &c.

7, Pratt Street, Lambeth, JAMES WHITE.
Feb. 20, 1838.

PRESERVING TIMBER.

A patent has recently been taken out for this purpose in America. The following is an extract from the specification, as given in the *Franklin Journal*.—

I take (says the patentee) a quantity of tar (either Stockholm, Archangel, or American), which I submit to the process of distillation, and the apparatus, or still, which I use for this purpose, is similar to what is called a pitch still, which is made of copper, and well known, and forms no part of my invention, nor does the process of distillation, for separating the essential oil from tar, which is effected in the manner following:—The still which I use will contain about 400 gallons, but I do not put into it more than three quarters of that quantity of tar, or twelve barrels, of the usual size, of either of the kinds before mentioned. The first product will be the acid of the tar, bringing with it a light coloured essential oil, which separates immediately and floats upon the surface of the acid in the receiver, which I *prefer of wood* (a cask with one head, furnished with a cock for the withdrawing the acid from below, being applicable to the purpose), after some time the acid will cease, and the essential oil will come over in a very considerable stream, which I collect from the receiver, to the extent of about four gallons to the barrel, or forty eight gallons in the whole, including that which came over in the first instance with the acid; the fire is then to be withdrawn, and the contents of the still, which by the extraction of the essential oil has become *pitch*, allowed to remain *in the still* until the following morning to cool, then it may be let off by means of a pipe fitted with a brass or iron plug, into a large receiver of cast iron, or other suitable material, and finally put into casks for sale.

I will now proceed to describe the combining of the essential oil with the other materials for the making of my "Metallic Solution." To effect this, I place *two* or more large casks upright, removing the upper head of each, and throw into them well rusted iron hoops, or tin cuttings. I then pump into them 100 gallons or more of the essential oil of tar, before described, completely covering the metal. This oil I cause to be repeatedly pumped every day from one cask to the other for about six weeks, by which time the oil will have become very black and much increased in gravity, whilst the iron hoops or tin cuttings will appear quite bright, and free from oxide.

They are then to be taken out and piled up in an open space of ground and set fire to, for the purpose of burning off the oil, and afterwards laid by for reoxidation, which may be much facilitated by pouring over them a weak solution of common salt and water; when they have again become rusted they are fit for use.

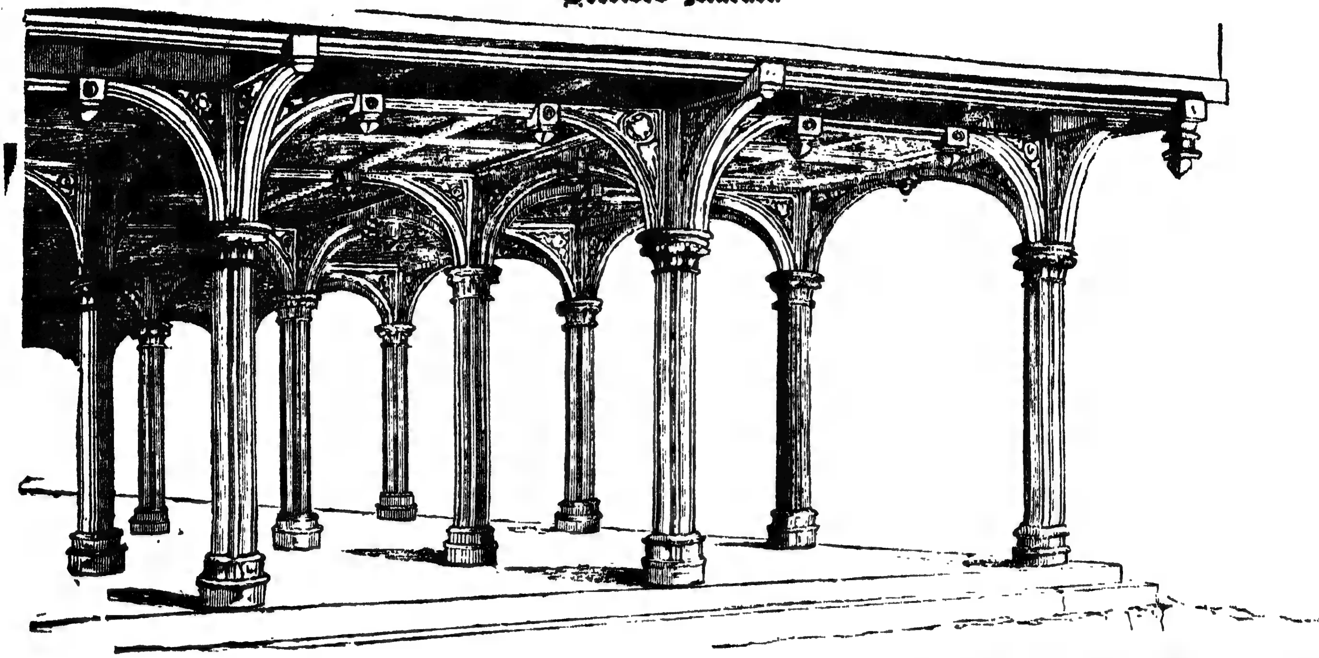
I will now proceed to describe the method I pursue in saturating timber and wood with the metallic oxide.

For saturating piles *already* driven into the sea, forming jetties, or piers, I cause an inch augur to be passed down the centre of the piles to the bottom end, if possible, or as far down as can conveniently be done, and "liquid oxide" poured down the hole until filled. This is to be repeated as often as may be thought necessary, but generally in two or three days it will be found oozing through the pores of the wood, depositing the incrustation of *iron*, which, in combination with the *essential oil* of the *tar*, resists alike the action of the water, and the attacks of the worm. A wooden plug or tree nail is then to be driven fast into the hole, which may be removed by the auger at any time for the purpose of giving the piles a fresh supply. This method is likewise applicable to the timber used in blocking streets, the woodwork on railways, and to all wood subject to damp or moisture, or the attacks of worms or other vermin. For out door buildings liable to dry rot, it may be used cold in the usual way of varnish or tar, with a brush; for being perfectly liquid, it penetrates most rapidly, drying completely in eight or ten hours, when a second dose may be given. Paint applied afterwards dries quickly, but for most purposes two or three applications of the preparation render any other coating unnecessary; for as soon as the pores of the wood become filled, it assumes the appearance of varnish.

Patent Pump.—We have witnessed the double action horizontal pump in operation at the Trades' Lane Calendering Company's premises, and were fully satisfied of its superiority over every kind of pump hitherto in use. It threw out a copious stream of water, without any intermission between the strokes, and without the friction of an ordinary pump. Its chief excellence, we think, is shown when converted into a fire-engine, with a leather attached to it for raising the water. When employed in this way, with two men working at the handles of the pump, a column of water was raised to the height of forty or fifty feet, scarcely inferior in size or force to that discharged by an ordinary fire-engine wrought by a dozen of men. We are convinced that the superiority of this invention cannot fail to bring it into general use.—*Dundee Courier.*

THE ANTIQUARIAN. No. 1.

Hereford Market.



Amongst the various subjects of a purely mundane character which excite the attention of thinking men, there are few which present a more varied, entertaining, and useful field for inquiry, than is to be found in the progress and vicissitudes of the arts of design. In the expression and form bestowed upon matter by the tutored hand of man, we see the fullest development given to his intellectual faculties, and the formation of a mute, yet eloquent language, affording us most palpable and unerring evidence of the peculiarities of thought and feeling, which have characterized periods enlivened by mental activity. The practice of the arts of design proclaim one of the great triumphs of man's existence on earth. It presents an ever-varying language of distinctly his own creating, placing him infinitely above all created things, and manifesting the divinity of his nature.

In viewing his formation, we are struck with the marvellous alliance existing between the hand and the mind, and feel convinced that the dignity of human nature is never more fully exemplified than when the admirable mechanism of the former is engaged in giving birth to the ingenious and graceful conceptions of the latter. When his faculties are thus employed, man appears in the graceful light of Nature's willing associate, engaging in her favourite scheme of adorning the earth.

This power of creating and imitating objects is one of the great prerogatives of man; and beauty being the principle which first rivets his looks on Nature, leading him subsequently to the enjoyment of her vast stores of treasure, and exalting and refining the speculations of the mind, nothing seems so natural than that he should seek to incorporate into his own works an element which exerts so vast and beneficial an influence over his existence; hence it is that nations, down to the most savage, have endeavoured to give *beauty* to their productions, thus paying tacit, yet unequivocal homage, to the grateful sway exerted by that quality over the mind in its mute but continual converse with external objects.

Of all nations who have thus hearkened to the voice of Nature, the first to interpret it with fidelity, and who have hitherto surpassed all others in that vocation, are the Greeks, whose devotion to the principle of visible beauty, engaged them in a profounded study of its laws, the essence of which they traced home to its sanctuary, the human form. It is now our fortune to be conversant with their works, may we learn to equal them, which we shall do, if a conviction of their beauty lead us to tarry at the source whence its authors drew forth their inspiration!

Although our ancestors have fallen short of the Greeks in the cultivation of the arts of design, still have they so improved those opportunities which were offered to them, and so fostered the styles which from time to time they were made acquainted with, as to render the study of their productions a source of interest and delight to the British antiquary.

Our attention is at once engaged by the complete harmony which characterizes the style in which they are composed, and the sane mode displayed in the development of the thought itself. This teaches us an important lesson; it shows that our artists of by-gone times studied Nature too, and prized the unity which reigns throughout her works. A very high degree of beauty results from their appreciation of that important element in design. This beauty is increased by the admirable adaptation of each and every part of these buildings to the purpose for which they were originally designed. The ornaments bestowed upon them, and by no niggard hand, are generally characteristic, revealing circumstances connected with the epoch, as well as the intention of their authors.

Thus thoughtfully conceived and executed, these buildings embody intellect which sheds light over the times which gave them birth. When, too, we bear in mind the sublime internal effects of many of the more important edifices, called into existence by religious devotion; the mathematical skill their construction displays; the thorough acquaintance with the resources of art, based upon an observation of the mysterious variety of nature, which these buildings exhibit, from the most important to those of least pretension, as is most clearly shown in the ingenuity with which corresponding parts are varied in the detail, without the least detraction from their uniformity of appearance; the profusion of ornament—degraded, it is true, at times by woful caricature and intentional deformity, but still evincing an untiring invention, which nought, save the love of Harmony, could control; the spirited and delicate execution of these ornaments, and every where the excessive finish they discover; the shrewd contrivances, and appreciation of optical effect, affording unequivocal proofs of the taste and intelligence of our ancestors, and of genius on their part in no way inferior to that of the artists of antiquity, wanting only their more chaste conception of style to have led to equally high results;—when to this we add the active agency of these remains, in recalling and elucidating by-gone events, frequently of the highest import to the living, their influence in imparting life and interest to the associations which they give rise to in the mind; that, in short, they stand as it were as beacons strewed over the land, guiding the imagination in its excursions into the past, it will be confessed that few subjects offer to the enlightened Englishman a more varied, entertaining, and useful field for inquiry, and that his interest and pledge for the discharge of a sacred duty are at stake, in the preservation of the antiquities of his country.

Hereford Town Hall and Market.

We have been guided in our selection of this subject, for the first number of the Antiquary, for the sake of giving an ancient building, which should combine utility in its design, taste in its decoration, and skill and ingenuity in its construction.

This hall is one of the masterly performances of the age of James the First, and is considered by Price to be the work of the famous John Abel, who many years afterwards rendered such signal services when Hereford was besieged by the Scots. The same author says

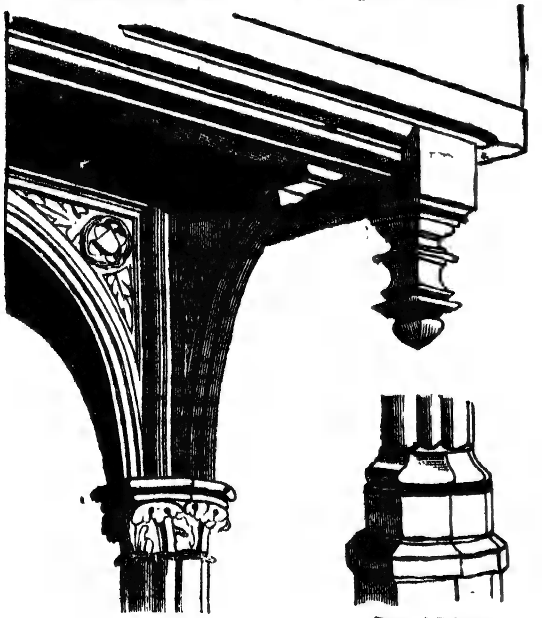
that "of all the buildings in Hereford, of a decidedly useful character, the Shire Hall is the most worthy of notice." This building, which occupies the centre of the Market Place, is in the form of a parallelogram, and consists of two stories; the lower, composed of twenty-seven Gothic stone pillars, with raised bases, and carved decorated capitals, supporting a timber framing; the upper (not given in the view) being entirely of timber, and projecting beyond the outer range of columns beneath. This projection gave rise to the necessity of brackets, which are so simply and ingeniously contrived, as to form a very graceful portion of the design.

The upper story has been lowered and much altered, from a fear that the columns had too great a weight to sustain; it was originally distributed into apartments, for the use of the different trading companies of Hereford. The portion thus altered was originally designed in harmony with the rest, and was always considered a most ingenious work, which we can the more easily believe from the merit of the remaining part. This part, intended for the business of a market, answers its end admirably; the overhanging portion increasing the shelter, and the slender points of support admitting abundance of light; the wear and tear incidental to a market, is counteracted by the harder material of which the columns are formed.

We are struck with the intelligent union of the two materials, stone and timber, in which the former displays itself as contributing to the support of the building, the latter as the means of combining the elegancies of art with the requisites of construction. Ornament, both characteristic and graceful in its composition, forms a prominent feature in this useful building, plainly showing that our former artists entertained that famous maxim of the Greeks of old, that a thing to be good, must, to its other qualifications, unite the beautiful.

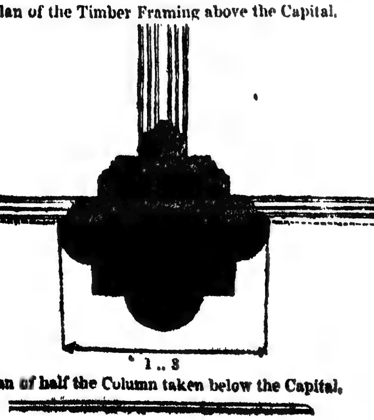
Finally, we may observe, that viewed either as a Work of utility, or as a specimen of art, Hereford Market is well worthy of the attention of the architect and amateur. A. W. H.

Pendant and Bracket over one of the angular Columns.



Base of Column.

Plan of the Timber Framing above the Capital.



Plan of half the Column taken below the Capital.

LONDON AND BIRMINGHAM RAILWAY.

Mr. R. Stephenson's Report to the Directors.

February 17th, 1838.

"In reporting on the present state of the works on the line, and our prospects as to future openings, it will not be necessary to treat in detail of that portion between London and Tring which is already open to the public, nor to mention specially the quantities of fencing, brickwork, &c., which remain to be done on each contract as stated in the estimates already delivered, such works being comparatively unimportant, and not likely to interfere in any way with the opening of the line. It may, however, be stated with reference to that portion between London and Tring, that the permanent road is in tolerably good order, except on the Brent embankment, near London, and on the Colne embankment, near Watford. Both these works have continued to subside, with scarcely any intermission, more or less rapidly since their formation; the former from the slippery nature of the material which composes it, the latter from the unsoundness of its substratum in the valley of the Colne. The gradual subsidence of embankments admits of no other remedy than maintaining the level of the railway by the constant supply of new sound material adapted for ballasting, which, in the present case, may fortunately be obtained from a convenient spot, and at a moderate expense, for there is, in the Company's possession at the south end of the Watford Tunnel, a large store of excellent gravel and chalk, sufficient to meet all the demands of the line and stations between Watford and London for some years.

"The only other points between London and Tring which call for remark, are the Boxmoor embankment, and some portions of the Aldbury contract, where we found it very difficult at first to keep the rails in working order; but they are now in much better condition, and will continue to improve rapidly during the ensuing spring and summer. By this period we may expect that all the embankments will become so consolidated, as to admit of the engines working over them without any necessity of reducing the speed below the proposed average speeds to be adopted with the passenger trains.

"*Tring Contract.*—This contract, which comprehended the most extensive excavation on the line, is now nearly completed. The whole of the excavations and embankments are ready for the further opening to Denbigh Hall, except that about 4,000 yards of permanent road remain to be laid, not in one length, but made up of several smaller portions. The greatest quantity, to be laid continuously, is about one mile at the south end of the great excavation, for executing which quantity, as well as all the other unfinished parts of the permanent road in three weeks, every arrangement was made at the latter end of December. It has, however, been impracticable to proceed as intended, owing to the intense and protracted frost which set in a few days after the beginning of the year, continuing up to the present date without a single available interval of one day. The contractors have been urged, and every expedient resorted to, for the purpose of proceeding with the permanent road so as to expedite the approaching opening, but without success. There still remains work, which, as nearly as can be calculated, must require three weeks to perform, after a thorough thaw has taken place. The embankments throughout this contract consist almost entirely of chalk, which being already well consolidated and little liable to subsidence, the immediate use of the permanent road may be reckoned upon as soon as completed.

"*Leighton Buzzard Contract.*—This contract is in a very similar position to the last, though in a more forward state. The excavations and embankments are completed, and the permanent road laid, with the exception of about a mile, made up of separate portions. The ballasting is all on the ground, and nothing remains to be done but laying the rails and blocks, which are also on the spot. The Sinslade Tunnel is completed, one line of permanent road laid through it, and the fronts so far advanced, that executing the remainder of the stone and brickwork will form no impediment whatever to the opening.

"*Stoke Hamond Contract.*—The excavations and embankments are completed, except a small portion left on the slopes of the cuttings, which cannot interfere with the permanent road. Of this there remains little more than a mile to lay in different places.

"*Bletchley Contract—completed, except 350 Yards of Permanent Road.*—This contract terminates at Denbigh Hall, where a station is now being formed for the temporary terminus of the London division of the line. The shed for the engines and coaches is erected—the necessary turnplates fixed—the sidings stopped from the frost, but in a state to be finished in a fortnight; the huts for the engine-men are ready to be inhabited—the stables for Chaplin and Co. in a forward state—a small office erected on the bridge over the turnpike road, and an approach to the level of the railway from the turnpike road nearly completed.

"From the above statements relative to the work remaining to be done between Tring and Denbigh Hall, it is evident that the time of opening through this district depends on and must be regulated by the completion of that portion of the permanent road remaining unfinished at the south end of the Tring excavation.

"*Wolverton Contract.*—The whole of the works on this contract have for some time past been advancing in the most satisfactory manner. The quantity remaining in the Denbigh Hall excavation does not now exceed 50,000 yards; part of which is to be conveyed into the Wolverton embankment, and the remainder thrown into spoil. The present rate of progress will justify the calculation that the cuttings and embankments, including the Wolverton embankment, will be closed in eight weeks from this time. The permanent road is also in an advanced state. The unfinished portion is less than two miles, the greater part of which will be laid before the excavations are finished. We may, therefore, calculate upon the permanent road being extended from Denbigh Hall to Wolverton in eight or nine weeks.

"*Wolverton Viaduct Contract* completed, with the exception of the permanent road, which cannot be commenced until the embankment is brought up to both ends.

"*Castlethorpe Contract.*—The excavations and embankments may be regarded as completed, the latter are entirely so. On the slopes of the excavations a quantity of rock is left purposely, the chief part being intended for ballasting the permanent road, of which there is yet to be completed a length of $2\frac{1}{2}$ miles. This does not much exceed the quantity stated as remaining on the last contract; and as the excavations are more advanced, the period for completion may be reckoned the same.

"*Blisworth Contract.*—The progress made throughout the works of this contract has, upon the whole, exceeded the estimated average. Hitherto this was to have been expected from the favourable position of the material excavated, and the large quantity thrown into spoil; but the character of the excavation is now more difficult, and as it gets deeper, the space for employing men gradually becomes more confined. The material is increasing in hardness, and within the last few weeks there has also been

a greater quantity of water. These impediments naturally render any estimated quantity which may be yielded by the south end of the excavation for the embankment southwards in some degree uncertain. An arrangement has, therefore, been made, and is at present acted upon, for throwing an additional quantity into spoil from the centre of the excavation, and supplying the deficiency in the embankment by a corresponding quantity of side cutting at the southern extremity of the contract. The object thus aimed at, is the completion of the south portion of the contract in May, nearly at the same time with the Wolverton and Castlethorpe contracts, at which period an extended opening may be made from Denbigh Hall to the village of Roade, situate on the turnpike road, leading from Stony Stratford to Northampton, and only five miles from the latter town. This position appears highly advantageous for the next temporary terminus, which must remain the terminus for the London division until the opening of the whole railway.

"In the Blisworth cutting there now remain about 100,000 cubic yards of material, which will be disposed of nearly in the following manner:—30,000 cubic yards to Ashton embankment; 35,000 cubic yards to Blisworth ditto; 35,000 cubic yards to spoil. The first quantity is that which relates to the opening of the line as far as Roade; and reckoning the south end of the cutting to yield at the rate of 10,000 yards per month, this may be effected in three months, allowing the necessary time for joining the permanent road.

"The completion of the Blisworth embankment will probably not much exceed the end of May, from which date the undersetting will commence. By the time this has advanced to the site of the spoil, it is expected the excavation will be cleared to the level of the permanent rails. The undersetting being a work of a novel character, and placed in a situation where contingencies will in all probability occur, there is some difficulty in calculating the time it will require. After giving the subject the most attentive consideration, I do not deem it advisable to state this at less than three months from the time of the excavation being entirely cleared or bottomed, bringing to the end of September the completion of the contract as regards readiness for the opening of the line.

"The future method of procedure and expenses in the Blisworth cutting have been calculated upon the evidence and appearances now before us, but it is not improbable that in the undersetting our plans may require modification as indicated by circumstances at the time. Such cases will necessarily increase the cost beyond what was last estimated; but the quantity of materials now remaining in the cutting being small, and a considerable portion of the space for undersetting being exposed already, the additional expense cannot, it is thought, be very considerable. Three miles of permanent way remain to be laid.

"*Bugbrook Contract.*—The excavations and embankments throughout this contract are closed; but it will be necessary to deposit an additional quantity of material upon one of the embankments, in which there has occurred a very extensive slip. About 2½ miles of permanent way remain to be laid.

"*Stowe Hill Contract.*—This contract is in a satisfactory state as regards the prospect of completion. The tunnel has been finished some time. A small quantity of excavation is yet to be brought from the south end of the tunnel to the embankment at the north end of the contract. There are about 600 yards of permanent road to lay.

"*Weedon Contract.*—The excavations and embankments are completed. There are about 1,100 yards of permanent road to lay, and the greater proportion of ballasting is on the ground.

"*Kilsby Tunnel.*—This work is at present in a very satisfactory state, and the monthly progress as regular as can be expected, considering the nature of the operations. No new difficulty has recently occurred, except the capricious appearance and disappearance of water in some of the shafts, both in and beyond the quicksand. Between these shafts the junction of the respective portions of the tunnel has consequently become rather uncertain, the actual rate of progress in tunnelling through the intermediate space falling short of what was estimated. To remove this source of contingency as much as practicable, it has been found necessary to sink additional shafts, for the purpose of dividing those unfinished portions which would require the longest time to execute, or in which our average rate of progress was most likely to be interrupted by water or a change in the nature of the strata. On the 20th of January last a careful admeasurement was made, to determine accurately the distance unfinished between each pair of shafts, and the time of completion for each calculated upon an average which there are no reasonable grounds for doubting. The results are stated in the following table:—

Quantity remaining between Shafts. Between.	Yards.	Progress per Month. Yards.	Time of completion. Months.	
1 *a* and 1 *b*	33	6	5½	say end of June.
1 *b* and 1 *c* ...... 44 to be done from intermediate shaft X 14	30	6	5	say middle of June.
1 *c* and *d* ...... 40 to be done from intermediate shaft Y 10	30	6	5	say middle of June.
1 *d* and 2 ...... 54 to be done from intermediate shaft L 16	38	6	6⅓	say end of July.
2 and V shaft B	53	9	6	say middle of July.
V shaft B and 2 *b*	69	12	5¾	say middle of July.
2 *b* and 3	17	12	1½	say middle of March.
3 and 3 *a*	25	12	2	say end of March.
3 *a* and V shaft A	28	12	2⅓	say middle of April.
V shaft A and 5	15	12	1¼	say end of February.
5 and 5 *a*	37	12	3	say end of April.
5 *a* and 5 *b*	37	9	4	say end of May.
5 *b* and 6	42	9	4⅔	say middle of May.
6 and 6 *a*	30	6	5	say end of June.

The averages of progress adopted in the table may appear to be scarcely borne out by reference to the reports of progress in some particular shafts; but such instances are accounted for, either by the occurrence of a fallen length (which was the case in one of the quicksand shafts), or by the proximity of the face of the tunnel to the shaft, which lessens the room for working, and invariably reduces the rate of progress below that which ought to be taken as a guide.

"The circumstances requiring the adoption of the expedients explained above (in order to avoid disappointment by the further protraction of the time fixed for final completion), have necessarily caused the expense of prosecuting this work to be materially augmented beyond what was estimated last year; and in addition to this, it has been found absolutely indispensable to increase the prices of mining, timbering, and brick-work, formerly paid to the sub-contractors, and which expense was proved to be altogether inadequate. In the quicksand especially, although effectually drained, the utmost caution in mining has been required, and an expenditure of timber unavoidably incurred, which would appear excessive and lavish to any one whose experience has been confined to ordinary tunnelling. The present plans of proceeding have been arrived at by close observation and mature reflection, and cannot with safety or propriety be altered for the purpose of economising. Several circumstances have occurred, demonstrating that none of our precautions or expenses have exceeded what the magnitude of the difficulties attending the work imperatively demanded.

"*Brockall and Long Buckby Contracts.*—These two contracts are under the same contractors, and have been worked conjointly; they may therefore be regarded as one, with reference to completion. The works are in a more backward state than they ought to be. There is an excavation at each extremity; one, near Weedon, containing 70,000 cubic yards; the other, at the south end of Kilsby Tunnel, containing 80,000 cubic yards. From these two excavations one intermediate embankment is to be formed, requiring 97,000 cubic yards. The redundancy of the excavations is to be deposited in spoil. With moderate exertions, these works may be closed in four months. There remain about 4½ miles of permanent road to lay.

"*Rugby Contract.*—This contract having been given up into the hands of this Company, is now proceeding under the direction of the engineers. A considerable proportion of the excavations, embankments, and permanent road is already executed, and there now remain two excavations to complete; one of them, at the north end of Kilsby Tunnel, containing 143,000 yards—the other, near Rugby, containing 102,000 yards. The quantity to be conveyed from each to the Hilmorton embankment is almost 60,000 yards, which will occupy four months, making the period for completing this contract extend to July; and to this we must add one month for the permanent road, making it the beginning, or say the middle of August.

"*Rugby Station.*—The works at this point are at present in rather a backward state, owing to the severe and continuous frost, which has almost entirely put a stop to the brick-work and permanent road. The booking-office walls are built, the timbering of the roof put on, the engine and tank-house in a forward state, as also the huts for the engine-men. The turnplates will be fixed in a few days. The completion of the permanent road will occupy a fortnight after it is practicable to commence laying it.

"From this station to Birmingham one line of permanent road is laid throughout, and the other, with the exception of a short distance (about 150 yards) in the Church Lawford cutting. Though laid, however, the road is not in a fit state throughout to be travelled upon by engines and trains; for on some of the principal embankments it requires to be raised and adjusted. But this is a work which with the proper number of men can easily be completed before those other points already specially alluded to, as regulating the approaching opening.

"*Birmingham Station.*—The large turnplate in the locomotive engine-house is completed, and the necessary rails fitting it for the reception of engines will be laid in a few days. The lines of rails in the passenger sheds are laid, and the requisite sidings will be completed in a fortnight.

"From the foregoing remarks on the respective contracts throughout the line, it will be perceived that the works, now remaining to be executed, are not only confined to a few points, but also limited in magnitude. Blisworth alone appears to involve difficulties which may possibly interfere with our calculations and prospects. From Denbigh Hall to Blisworth the works are now rapidly approaching to a close. The great feature of that portion of the line—the embankment over Wolverton Valley—will be joined to the viaduct in about a month; and the line virtually finished and prepared for passengers as far as Roade, in the course of May next. The unfinished portion of the line will then be confined to the distance of miles between Blisworth and Rugby; but the greater portion of this length is at present nearly complete, and the only works of any magnitude remaining are

"I. The Blisworth excavation, now containing not more than 100,000 cubic yards of materials to be removed.

"II. The Long Buckly contract, with two excavations, both of which may easily be executed in less than four months.

"III. The Kilsby Tunnel, with 400 yards of tunnelling to do, divided into portions so limited in extent, that the calculated periods for the junctions being formed between the shafts (as detailed in the table given under the proper head), may be looked forward to with almost entire confidence; and

"IV. The Rugby contract, now in a very forward state; the unfinished works being confined to two excavations, favourably situated and circumstanced for suitable measures being adopted to secure their expeditious completion.

"Of these four points there are two, the Long Buckly and Rugby contracts, which involve no difficulty whatever, the works being quite of an ordinary character; of the remaining two, Kilsby and Blisworth, it is only the latter which need be regarded with particular anxiety, and this work it does not appear impracticable to complete in time, should the approaching season prove favourable. Unless there should be impediments to the undersetting of the rock with masonry exceeding what is at present anticipated, we may reckon upon an opening through it in six months from the 1st of March next, which would make its completion almost, if not actually, simultaneous with that of Kilsby Tunnel." "ROBERT STEPHENSON."

GREAT WESTERN RAILWAY.

Extracts from Mr. Brunel's Report to the Directors.

"The Company's works at Paddington are going on with spirit, and the station, which is intended to serve all the purposes of passenger traffic, until the whole line is opened, will be completed in ample time. The engine-house is finished, and the carriage sheds are in a forward state.

"A settlement of the Hanwell embankment occasioned at one period some anxiety, and involved the necessity of precautionary works to prevent any serious consequences; although the subsidence was at the worst much less than has been

observed in similar embankments on other works, it was thought desirable to take the most decisive steps to remedy the evil; and these, judging from the gradual diminution in the movements, appear to have been successful. In all other places the embankments are firm; and it may be stated generally, that the brickwork and masonry are exceedingly substantial and good.

"The bridge across the Thames beyond the present temporary station at Maidenhead, which is one of the most important works of the Company, is in a very forward state, the arches having been turned for about two months, and the centering will be eased very shortly.

"The works from that point are steadily progressing, and assistance will be given to complete the embankment beyond the bridge, from the eastern side of the river. The opening to Twyford will be expedited as much as possible, but must in a great degree depend upon the facility with which the supply of material for the permanent way may be obtained. The contract for the works expires in the month of May.

"At Sonning, the excavations are proceeding without intermission, and satisfactorily, as regards the execution; but it is clear to the directors that the contractor will not finish the open cutting there at the time specified in his engagement. From Reading to Didcot, where the Oxford branch will unite with the Great Western Railway, the work is divided into five contracts, two of which have been already let to a highly responsible contractor. Tenders for two other contracts have been invited for the 22nd March, and these, with arrangements making by the Company for the execution of an intermediate portion, will constitute the whole work to Didcot. The work on the space intervening between that place and Shrivenham is very light, and will be commenced in the course of the summer, and cannot occupy more than fourteen months in construction.

"From Shrivenham to Chippenham the earthwork is heavier, and will consequently be first undertaken, so as to be completed within the same time as the Box Tunnel, and those works which govern the opening of the entire line, and which have been been contracted for; the principal of these works being the contract between Chippenham and the eastern end of the Box Tunnel, which has proceeded satisfactorily, considering the nature of the work and the unfavourable state of the weather.

"The entire length of the Box Tunnel has been undertaken by contractors of character, ability, and property, and on terms satisfactory to the Directors and Engineer, though higher than had been originally contemplated; an increase that may be attributed chiefly to unfavourable rumours industriously circulated, of difficulties presented by the soil, and of the length of time that would be necessary for the performance of the contract. The Directors have, therefore, peculiar pleasure in stating, that the first-mentioned impediment has, in fact, no existence; the principal part of the tunnel, as shown by the shafts now completed, being carried through Bath stone, and the remaining portion through the Lyas limestone, and so firm and dry a marl, as gives equal assurance, both of the security of the works, and the certainty of its progress; whilst the answer to the second imputed difficulty, will be found in the fact of the whole having been contracted for to be completed within about thirty months.

"Every effort has been made to expedite the progress of the works between Bath and Bristol. The peculiarly laborious nature of these can only be fully understood by such as are well acquainted with the general localities of the line in this district, and are of a kind, which, when considered in connexion with the dimensions of the tunnels, the facilities of the levels, and that superior degree of completeness throughout the whole, which it is the object of the Directors to attain, will, in a great degree, account for its construction having been less expeditious than was anticipated, although they feel it to be their duty to state, that independently of these circumstances, the rate of progress made in part of the work under contract has not equalled their just and reasonable expectations.

"The peculiarity of the plan which has been adopted, consists principally in two points; first, in the use of a light flat rail, secured to timber, and supported over its entire surface, instead of a deep heavy rail, supported only at intervals, and depending on its own rigidity. Secondly, in the timbers which form the support of this rail being secured and held down to the ground, so that the hardness and degree of resistance of the surface upon which the timbers rest, may be increased by ramming to an almost unlimited extent.

"The first, namely the simple application of rails upon longitudinal timbers is not new; indeed, as mentioned in a former Report, I believe it is the oldest form of railway in England, but when lately revived and tried upon several different Railways, it has not, I think, succeeded as fully as was anticipated, and I believe this is very much owing to the want of some such means as that which I have adopted for obtaining a solid and equal resistance under every part of the timber, and a constant close contact between the timber and the ground. As I believe this to be entirely new, and to constitute an essential part of the plan, I trust I shall be excused dwelling upon it for the purpose of fully explaining it.

"In all the present systems of rail laying, the supports, whether of stone blocks or wooden sleepers, simply rest upon the ground, and, consequently, only press upon the ground with a pressure due to their own weight: this is trifling, compared either to the weight which rolls over them, or even to the stiffness of the rail which is secured to them. The block or sleeper must lie loosely upon the ground; if you attempt to pack under it beyond a certain degree, you will only raise it, and for the same reason, it is impossible to pack under the whole surface of a block or sleeper; one corner or one end is unavoidably packed a little more than another, and from that moment the block or sleeper is hollow elsewhere. If this block yield as the weight rolls over, the rail itself, resting on the two contiguous supports, is sufficiently stiff to raise it again, and the support becomes still more hollow; such is the operation, which may frequently be observed by the eye, more or less, in the best laid railways.

"Where continuous longitudinal sleepers have been tried, they have also been laid loose upon the ground; having no weight in themselves, their length has rendered it impossible that they should be well supported by the ground underneath, or that they should continue so, even if it were practicable to lay them well in the first instance.

"It will be perceived at once that two lumps or two hard places in the ground may leave such a timber unsupported for the interval of twenty or thirty feet in length, and, under the weight of an engine running rapidly over, it must in such a case yield and spring from the ground.

"In the present plan these timbers, which are much more substantial than those hitherto tried, are held down at short intervals of fifteen to eighteen feet, so that they cannot be raised; gravel or sand is then rammed and beat under them, until at every point a solid resistance is created, more than sufficient to bear the greatest load that can come upon it; as the load rolls over, consequently the ground cannot yield—the timber which was held tight to the ground cannot yield, neither can it spring up as the weight leaves it; and if the rail be securely fixed every where in close contact with the timber, that also is immoveable: such was the theory of the plan, and the result of the experiment has fully confirmed my expectation of success.

"The experiments have been made under several disadvantages, and I am glad that it has been so, as we are more likely to perceive at once, and to remedy any defects which might otherwise have lain concealed for a time. The packing, upon which it is evident every thing depends, was effected during long-continued wet, and while no drainage at all existed: looking forward to the necessity of re-packing once or twice, the timbers and packing were left completely exposed. The severe frost which immediately followed converted the wet sand into a mass of stone, which we have in vain attempted to disturb, and the continued dry frost has gradually evaporated the water it originally contained. The packing has shrunk considerably, and the exposed surfaces crumbled away, while the mass is still so hard within as to resist the pick-axe, and has been with difficulty broken through at some points with a smith's cold chissel and hammer. Under these circumstances, with an engine weighing between fourteen and fifteen tons (and from want of adjustment, with more than half of this occasionally thrown upon one pair of wheels) constantly running over the rails, the timbers have stood most satisfactorily."

To render the report as explanatory as possible, we have annexed engravings of the Railway as adopted on the embankment near Maidenhead, drawn to a scale of 8 feet to 1 inch. —EDITOR.

Fig. 1 and 2. Transverse Section and Plan of Railway.

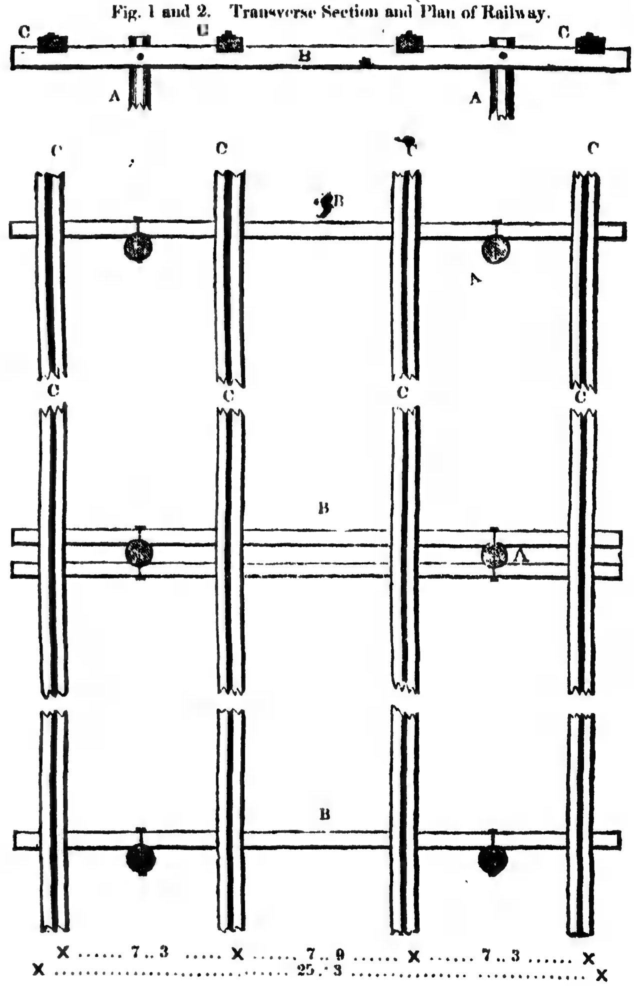


Fig 3. Fig. 4.

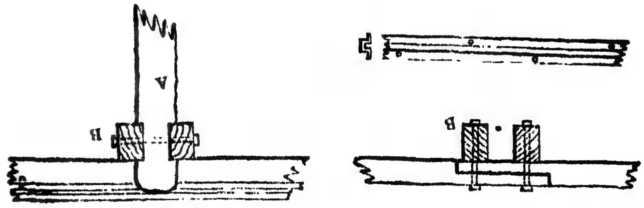


Fig. 5.

A Piles of beech timber 10 and 9 inches diameter, and about 8 feet long.

B Cross beams or transoms of *pine* timber, 13 inches by 6 inches, which are framed and fastened to the piles with iron bolts. These transoms are placed at 15 feet apart, and are placed alternately double and single, as shown in the drawing.

C Longitudinal Sleepers of Pine timber 9 by 6 inches, upon which the rails are fastened, as shown at large in Journal No. 5, page 105, with a piece of wedge-shaped hard wood, between the rail and the sleeper. A piece of felt is laid under the rails.

Fig. 3, is a side view of the Sleepers, at one of the joints, showing the way they are fastened down to the cross beams.

Fig. 4, is a side view (drawn at double the scale of figs. 1 and 2) of the rail, sleeper, cross transoms, and one of the piles, showing the way they are fastened together.

Fig. 5, is a plan of the rail, showing the holes that are punched in the flange for the screw to fasten the rail down to the sleeper.

Note.—All the timber is *Kyanized.*

IMPROVEMENTS IN STEAM NAVIGATION.

At the last Annual Meeting of the British Scientific Association, held at Liverpool, a grant of money was placed at the disposal of a committee, to investigate the actual performance of steam-vessels, with reference to their speed, consumption of fuel, and other circumstances affecting their general efficiency. This investigation arose from a discussion which took place in the mechanical section, in the course of which statements the most conflicting were made, even by practical men, as to the capabilities of steam-vessels for extended navigation. In prosecuting their inquiry, the committee have thought it desirable to adopt some method of registering the actual performance of the vessel in a log, which will not be subject to the errors and neglect which have hitherto rendered all steam-logs more or less useless.

With this view Dr. Lardner has attempted to construct a piece of mechanism, which will enable the steam engine itself to write the journal of its own proceedings. This mechanism is now being constructed, and is intended to be placed in the *Tagus*, a large and powerful steam ship belonging to the Peninsular Steam Navigation Company, this Company having liberally offered to co operate with the committee.

The circumstances on which principally the efficiency of the machinery and the vessel depends, and which it is necessary to register, are the following:—

1. The height of the barometer-gauge, which indicates the state of the vacuum produced by the condenser.
2. The height of the steam-gauge, which indicates the actual pressure of steam urging the piston.
3. The height of the steam-gauge, which indicates the actual pressure of steam in the boiler.
4. The number of revolutions of the paddle-wheels per minute.
5. The depth of water in the boiler.
6. The degree of saltness of the water in the boiler.
7. The rate of the vessel.
8. The draught of the vessel, or her immersion.
9. The direction and force of the wind.
10. The course of the vessel.

The mechanism now being constructed will keep a self recording register of the first six of these. A provision is, however, made for subsequently adding means of registering the seventh and eighth, should it be found desirable to do so. The consumption of fuel will be easily determined by keeping an account of the quantity of coals delivered into the vessel at each port, making an allowance for what is consumed in the steward's room, kitchen, and cabins.

A float is placed on the mercury in the barometer gauge, from which a rod proceeds, to which the pencil is attached. As the column of mercury rises or falls, the pencil receives a corresponding motion; and being pressed against the paper on the cylinder, leaves a trace upon it, which measures the extent of the variation of the mercurial column.

The heights of the steam and other gauges are registered in the same manner by other pencils.

The entire apparatus will be enclosed in an octagonal case, about three feet and a half high, and three feet diameter. It will be locked by the agents of the owners when the vessel starts on her voyage, and will not be opened till her return. It will require no other attendance during the voyage than that of winding the clock.

The several pencils will be of different colours, so that their traces may be easily distinguished one from the other. Besides which, it will be arranged that their play may be confined to different parts of the cylinder.

At the end of each voyage the paper will be removed from the cylinder, and replaced by a clean sheet.

If it be thought advisable, the indications of the several curves traced by the pencils may afterwards be translated into the ordinary language of log books.

It is not improbable that an anemoscope and other apparatus may be contrived, by which the direction of the wind and the course of the vessel may likewise be recorded—at least, with as much precision as they are now ascertained by other and less regular expedients.

If this mechanism should succeed in attaining the objects for which it has been contrived, besides its valuable scientific results, it will be productive of great benefit to the proprietors of steam-ships, by supplying to them a never-failing check on every one concerned in the management of the vessel. Thus any relaxation of attention, or want of skill on the part of those in care of the fires, will be indicated by the third pencil. Any neglect in feeding or blowing out the boilers will be indicated by the fifth and sixth pencils. The attention to the state of the condensing apparatus will be shown by the first pencil.

In the event of the temporary suspension of the operation of the machinery for adjustment, or any other cause, the fact of such suspension, its duration, and the time it took place, will be also recorded.

By the connexion of all the indicators with the timepiece, the exact hour, or indeed minute, of each registered circumstance will be recorded.

Monthly Chronicle.

THE "GREAT WESTERN STEAM SHIP."

This vessel is now out of dock; she has been during the last fortnight making trials of her machinery previously to leaving the river Thames for her return to Bristol, from which place it is expected she will take her departure for New York early in the present month. The Directors of the Company have spared no expense to render her a truly magnificent vessel, worthy of trading between two such great and powerful nations as England and America; they have been exceedingly judicious and cautious in selecting all the parties in any way connected with her build; Mr. Patterson was engaged as the Ship-builder; Messrs. Maudsley, Sons, and Field, of London, as the Engineers; and Mr. J. K. Brunel, as Consulting Engineer, who gave his valuable services *gratuitously*. The dimensions of the vessel are—

Length between perpendiculars 217 feet, length over all 234 feet, beam 35½ feet, breadth from out to out of the paddle-boxes 58 feet, depth 23¼ feet, and registered admeasurement 1340 tons. Her floors are of great length, and overrun each other; they are firmly dowelled and bolted, first in pairs, and then together by means of 1½ inch bolts, about 24 feet in length, driven in four parallel rows, scarfing about 4 feet. The scantling is equal in size to that of our line-of-battle ships; it is filled in solid, and was caulked within and without up to the first futtock heads previously to planking, and all to above this height of English oak. She is most firmly and closely trussed with iron and wooden diagonals and shelf pieces, which, with the whole of her upper works, are fastened with screws and nuts, to a much greater extent than has hitherto been put in practice. She has stowage for 800 tons of coal, or coal and cargo combined, without touching upon her provision and water room for 300 people. Besides ample space for officers and crew (comprising about 60 persons), there are state rooms, &c., for 128 first class passengers; there are also 20 good secondary berths; and should it eventually be found advisable to forego cargo space altogether, about 100 more sleeping berths might be easily and conveniently arranged. Such of her timbers as may be exposed to alternations of dryness and moisture has been prepared by Kyan's patent process; and every effort has been made to combine the various points of naval architecture and engineering, so as to render them most effectual in a service requiring speed, strength, and accommodation, and in which she will have to compete with the finest sailing passenger vessels in the world.

Her engines, which were the admiration of all parties who saw them, were manufactured by Messrs. Maudsley, Sons, and Field, justly eminent for the superiority of their workmanship; they are the two largest marine engines that have been made, and are equal to 450 horse-power. The boilers are constructed with several adaptations for the economy of steam and fuel, on an entirely new principle, which has greatly economised space, and, it is believed, will very much lessen the consumption of coal. They consist of four distinct and independent boilers, so that the engineer can work such number only as circumstances may require; while, by means of passages reserved between them, he can cool, examine, repair, and clean those not in use. The wheels have the cycloidal paddles, which are of iron, and possess decided advantages.

In studying the convenience, comfort, and decoration of the cabins, points which are of great importance in a vessel carrying passengers of a superior class, the Directors have engaged the services of artists and tradesmen recommended for their taste and experience. The ornamental work of the principal apartment will be found as well adapted to its purpose as it is novel and beautiful in its application, which we understand was intrusted to Messrs. Jackson and Sons, of Rathbone Place, London, who, we are happy to say, have fully executed their trust with considerable skill, taste, and judgment.

The Saloon, which for size and splendour exceeds any that we have seen afloat, is seventy five feet in length and twenty one feet in breadth, exclusive of the recesses on each side, where the breadth is thirty four feet, and nine feet high in clear of the beam, which is increased by the lanthern lights; each side, excepting where the recesses intervene, are occupied with *state cabins*. The ornamental work is very judiciously arranged, there being neither a profusion nor paucity of decoration. The front of the two recesses is divided into three compartments by small columns, formed in imitation of palm trees, with branches of leaves entwined over the openings, which have a neat and pleasing effect. At each end of these two recesses are large pier glasses, fitted in richly ornamental frames, in imitation of Dresden china. The fronts of the small cabins are divided into compartments, with panels about five feet high, and one foot six to two feet wide, tastefully decorated by no less an artist than *Edward Thomas Parris*, R.A., and historical painter to Her Majesty. Each panel contains an admirable painting in the *Wateau style*, representing rural scenery, agriculture, music, the arts and sciences, interior views and landscapes. Above the doors are small panels, containing (by the same artist) beautifully pencilled paintings of Cupid, Psyche, and aerial-like figures, which considerably heighten the appearance of the saloon. The ceiling and such parts of the saloon not occupied with the paintings are painted by Mr. Crace, of Wigmore Street, of a warm and delicate tint with the mouldings and enrichments, picked in a light colour, and relieved in gold, not too much so as to give a gaudy appearance, but just sufficient to produce a richness of effect, without encroaching or detracting from the principal features of the saloon (Mr. Parris's paint-

ings). The small cabins on each side, and communicating with the saloon, each contain two sleeping berths, so arranged that in the day time they may be turned up against the side of the vessel, and conceal the bedding, thereby forming a small sitting room, seven feet by eight feet. At the end of the state cabin is the ladies' saloon, which is very tastefully fitted up by the upholsterer, and on the opposite side is the steward's room, containing every convenience to render this important department (to the passenger) complete. It is furnished with a supply of salt and fresh water, and one of Stirling's filterers. The arrangement of the bells is deserving of notice. In the steward's room, standing on a shelf, are two small mahogany boxes, about one foot long, and eight inches square, each containing a bell, communicating, by means of wires, to every berth, cabin, and other department in the vessel. When the attendance of the steward is required, the passenger pulls the bell rope in his berth, which rings the bell in the small box, and at the same time, by means of a small lever, forces up, through a slit in the lid, a small tin label, about two inches by one inch, with the number of the room painted on it requiring the services of the steward, and there remains until the steward has ascertained the number of the room, and pushed it down again. Thus, instead of having an interminable number of bells, one for every department, there are only two. This arrangement, which is alike ingenious as it is useful, is deserving the notice of architects. We understand it is the invention of a person residing at Greenock. Between the steward's room and the ladies' cabin, in the midship, is a spacious staircase, with handsome ornamental railing bronzed and gilded, the wood work painted in imitation of Pollard oak.

The figure-head of the vessel is deserving of notice: it is a demi-figure of Neptune, with his trident admirably carved and gilded; and on each side are dolphins, finished in imitation of bronze. The mouldings are also gilded.

We are happy to announce from our observation, when on board the vessel, at a time when she was crowded by noblemen and gentlemen of all ranks, besides several scientific persons well acquainted with the construction of steam ships, that all agreed that the build of the vessel, the exquisite workmanship of the steam engines, the beauty of the decorations, and the fittings in general, deserve their unqualified approbation and praise.

DIMENSIONS OF THE GREAT WESTERN STEAM VESSEL, ENGINES, BOILERS, &c.

	Ft.	In.
Length of vessel between perpendiculars	212	
Length of vessel *over all*	236	
Depth of hold	23	3
Extreme breadth of beam	35	4
Width from outside to outside of paddle-case	58	4
Draught of water (loaded)	16	
Burthen in tons, 1340.		
Diameter of paddle-wheels	28	
Length of paddle-boards	10	
Height of centre of shafts	18	5
Numbers of revolutions per minute, 15 to 16.		
Diameters of shafts, 15 and 16 inches.		
Width of bearings, 15 inches.		
Diameter of cylinders, 73 inches.		
Length of stroke	7	
Diameter of air-pump, 40 inches.		
Length of stroke of do.	3	6
Length from centre of shaft to centre of cylinder	19	6
Width from centre to centre of engines	13	
Four boilers of equal dimensions . . . Length	11	6
Width	9	6
Height	16	9

Weight of engines, about	200 tons.
Do. boilers	100
Water in boilers	80
Intended to carry coals in tons	600
Capable of carrying	800

Consumption of coals, 1¼ tons per hour, when engines are in full work; or 30 tons *per diem*.

600 tons will give	20	full days' consumption.
700 „	23⅓	„
800 „	26⅔	„

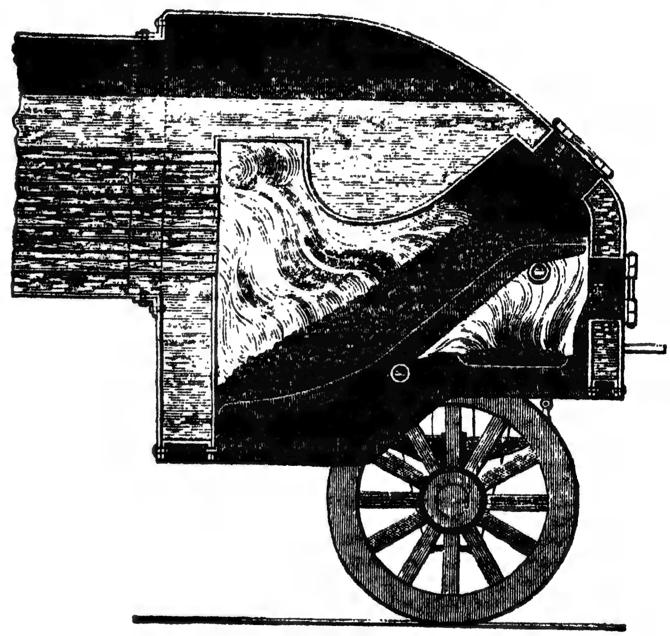
It is presumed that no voyage will require the full working of the engines for the whole time, but that favourable winds, for some part, will reduce the quantity of coals required.

The boilers and steam-pipes are to be clothed with a coating of red lead, felt (an excellent non-conductor), and canvass, which will not only prevent a great waste of radiating heat, but will also keep the engine-room and the vessel perfectly cool.

CHANTER AND GRAY'S PATENT SMOKE CONSUMER,

Applicable to Steam Boats, Locomotive Engines, Stationary, and other Boilers.

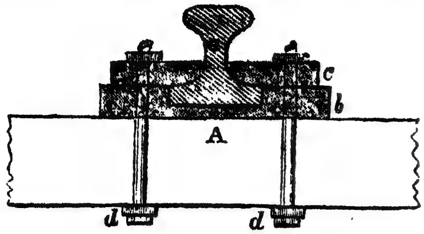
The principle of the smoke consumer essentially consists in so arranging the form of the furnace and position of the bars, that the fuel is regularly advanced by gravitation, upon inclined fire-bars, without the aid of machinery, or any apparatus besides the simple instruments in common use for the management of furnaces; the carbon and various inflammable gases are set free in the process of combustion, and being more charged with the oxygen of the atmosphere and heat of the fire, proceed through and over the fire, which, increasing in heat to its termination, gradually subjects the less combustible gases to perfect combustion. Saving in fuel is thus effected; for in the present furnaces, these are not only passed off unconsumed, but by preventing the ignition of more combustible materials, necessarily waste a large portion of the burning fuel. Thus the primary effect, in the operation of the patent furnace, may be stated to be that of obtaining, at the termination of the furnace, that intense degree of heat indispensable to the entire combustion of the various substances emitted from the burning fuel. This invention is exhibited in the specification in twelve different forms, showing its application to every description of furnace. The details are somewhat varied; but the most important part of the principle, namely, the absolute combustion of the vapour, is thus effected in all of them.



The annexed engraving is a section showing the adaption of the patent smoke-consumer to a locomotive engine. By reference to the drawing, it will be perceived that the furnace is made raking or inclining downwards at a considerable angle, which is so regulated that the fuel will gradually slide down as it becomes consumed; the larger, or more weighty fuel at the top, forces down that which has been partially decomposed, and so on, until it be reduced to a very small cinder, or ash, when it will drop through the aperture at the foot of the grating into the ash-pit. The furnace is charged in the following manner:—The coals are laid within side of the door, so as to completely fill the mouth of the furnace (and not thrown into the centre, as is generally adopted in the ordinary constructed furnace); here the coal is converted into coke, by the intense heat of the fuel below, which is in a high state of combustion; the smoke and gases arising from the fresh fuel is driven, by the great draught passing between the bars from the ash-pit, against the inclined surface of the underside of the boiler; hence it is reverberated on to the burning fuel, and completely consumed. In the ash-pit is placed a grating, or *saveall*, to catch the small coals which may drop through the bars, where they are consumed, and the heat arising therefrom passes into the furnace above, thereby saving a considerable portion of fuel that would otherwise have been lost.

The smoke-consumer has been, within the last few days, publicly exhibited at the Patentees' premises, in Earl Street, Blackfriars. Several of the most eminent engine-makers in the metropolis attended to witness it in operation. They all agreed that the patent was one of great importance, and that it effects a *perfect consumption of the smoke.* We were present for upwards of an hour, and witnessed several charges of fresh coal being put into the furnace, and during the whole of the time we did not see a particle of smoke escape from the chimney. The Patentees exhibited several models and drawings, showing how the consumer may be adapted to marine and other boilers.

AMERICAN RAIL AND CHAIR.



THE annexed figure is the section of a wrought-iron rail and wrought-iron chair, as adopted in America. The depth of the rail is uniform. The upper web is of the same form as the ordinary rail. The rib is plain, and varies from six-tenths to eight-tenths of an inch in thickness. The lower web is, in some examples, not so wide as the upper web by nearly half an inch, and in others it is somewhat wider. The depth varies from four and a half to five inches.

A, is the wooden sleeper, to which the chair is fastened; *a*, the wrought-iron rail; *b*, wrought-iron chair; *c*, wrought iron clamping-pieces, confining the chair by means of the two nut and screw bolts *d d*, to the sleeper.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

REPORTS OF PAPERS READ AND PROCEEDINGS, SESSION 1838.

(Continued from page 140.)

On the Application of Steam.

THE minutes of the discussion on Mr. Wicksteed's paper and the Cornish engines having been read, Mr. Parkes called the attention of the Institution to the importance of the question of the applicability or inapplicability of the Cornish system of using steam to condensing engines generally. It seemed to him, after the confirmation which the statements regarding the Cornish engines had lately received from the praiseworthy exertions of Mr. Wicksteed, that, as regards economy of fuel, the Cornish engine was even still more superior to the low-pressure engine, than the latter was (at the period of its invention by Mr. Watt) to the original atmospheric one; that there existed, indeed (if all we heard were true), less economical difference between Mr. Watt's and the high-pressure or non condensing engine, than between the Cornish and the common Boulton and Watt engine. If such were the case, which could now scarcely admit of a doubt, Mr. Parkes thought, that the interests of science and the arts demanded a much more thorough and searching investigation into the rationale of the Cornish engine than had yet been made; and he thought it a reproach to the Institution, that no one of its members is yet prepared to say, whence arises the superiority of the Cornish engine, nor what is the relative value of the various perfections which had been for so many years assigned to it by its employers.

Mr. Parkes thought that most engineers were agreed, that the low-pressure crank-engine, used for manufacturing purposes, required, in its highest state of condition, at least ten pounds of good coal per horse per hour; that such was Mr. Watt's own estimate, allowing one pound of coal for the evaporation of seven pounds of water. He had had many opportunities of proving—so far as the Indicator can be relied upon—the load and consumption of Boulton and Watt's own engines, as well as engines by other makers; but only in three instances had he found the consumption so small as ten pounds. He had only in one instance been concerned in ascertaining the duty done by a pumping engine—which was one of the same kind—not working expansively; and as this experiment was conducted with the most rigorous exactitude, the correctness of the results might be relied upon. The engine was nominally one of forty horses' power, constructed by Messrs. Hick and Rothwell, of Bolton, erected at St. Ouen, near Paris, and employed to raise water, by means of a scope-wheel, to supply a new dock. The experiments of two consecutive days were managed and checked by M. Arago, M. Jouy, Mr. H. Farey, and Mr. Parkes. By the Indicator, the engine proved to be working exactly to forty horses' power, with a consumption of eleven pounds of good Mons coal per horse per hour: but as the actual weight of water raised, one foot high per minute, divided by forty horses, attained 36,000 pounds, the real consumption was about ten pounds of coal per horse per hour. Mr. Parkes adduced this experiment, with an engine of the most perfect construction and in perfect condition, as evidence, that the duty of the common low-pressure crank-engine, not working expansively, does not exceed twenty or twenty-one millions of pounds raised one foot high by ninety or ninety-four pounds of coal; and thus that the Cornish engine, investigated by Mr. Wicksteed, exceeds such engine, in economy of fuel, in the ratio of five to one.*

Mr. Parkes then entered at some length into a consideration of the various phenomena to be observed, and facts to be ascertained, in order to determine the separate value of the parts of the system adopted in Cornwall. The assertion that the boiler was superior to others, would be confirmed or disproved by measuring the water evaporated by the fuel used—which might also be done with such accuracy, as to furnish us with the very important knowledge of the quantity of water in the shape of steam required for each stroke of the piston. A thermometric steam gauge should be fixed on the boiler, and another as near as possible to the cylinder, to determine both the pressure within the boiler, and at what pressure the steam really enters the cylinder. He suggested also that another such thermometer, fixed on the cylinder cover, might be useful, in conjunction with the Indicator, to determine the increments of expansion, as well as the highest and lowest degree of pressure within the cylinder. That it appeared to him the Cornish engineers had carried out to perfection Mr. Watt's axiom, that "the cylinder should be maintained as hot, and the condenser as cold, as possible," and that since the hot jacket probably played a still more important part to the cylinder of an expansive than to a non expansive engine, no means should be left untried to ascertain the value of that element. That the thermometric steam gauge might also be an useful adjunct to the barometer, in determining the amount of vacuum in the condenser, and other phenomena connected therewith. The proportions of the air-pump and condenser to the cylinder, adopted by the Cornish engineer, should also be noted, as well as the temperature of the injected and ejected water.

On the Expansive Action of Steam in Cornish Engines. By W. J. HENWOOD.

AT the commencement of this paper, the author describes, with great detail, the action of the Indicator, and the nature of the evidence which it furnishes on the working of an engine. The author then states the results arrived at on applying the Indicator to the cylinders of some of the best engines in Cornwall. The peculiar circumstances of each case, as the clothing of the boilers, steam pipes, and the various methods adopted for keeping up the temperature of the cylinder, are detailed. The steam cases or jackets of some of the engines were filled with dense steam from the boilers of others with heated air. The dimensions of the working parts and the loads of the engines; the water and steam in the boilers; the temperatures of the hot well of the condensing water, of the boiler shod, engine house, and external air; the duration of the experiments; the coals consumed, according to weight and measure; the quantity of oil and grease; the number of strokes; the duration of each experiment; and the pressures of the boiler and cylinder, are tabulated for the respective engines.

The greatest duty recorded as performed respectively by the measured bushel, by 84 pounds damp, and by 84 pounds dry, is $86\frac{1}{2}$, $72\frac{1}{2}$, and $77\frac{1}{2}$ millions.

Particulars of the Construction of the Floating Bridge, lately established across the Hamoaze, between Torpoint, in the county of Cornwall, and Devonport, in Devonshire; by JAS. M. RENDEL, *Member.*

THE width of the river Hamoaze, at the site of the bridge, is at high-water 2,550 feet, and low-water 2,110 feet. The greatest depth at high-water is 96 feet, and low-water, 18 feet. The strength of the current at ordinary spring-tides, is from 260 feet per minute, or nearly three knots an hour, to 330 feet per minute, or three knots three-fourths an hour, varying in different parts of the passage; but heavy land-floods, accompanied by a north-west wind, make the ebb tides run with a velocity of nearly five knots an hour.

The site lies directly at right angles to the line of current, a disadvantage that could not be avoided, as the mooring of the ships of war prevented the selection of an oblique line of direction, and the situation is so exposed, that ships lying in ordinary, in the immediate vicinity of the bridge, sometimes drag their moorings.

The bridge is a large flat-bottomed vessel, of width nearly equal to its length, divided in the direction of its length into three divisions, the middle one being appropriated to the machinery, and each of the side ones to carriages and traffic of all kinds. These side divisions or decks are raised from two feet to two feet six inches above the line of floatation; and by means of strong and commodious drawbridges or flat forms hung at each end of each deck, carriages drive on and off the deck from the landing places without difficulty, or occasion for the least disturbance of horses or passengers.

The bridge is guided by two chains, which, passing through it over two cast-iron wheels, are laid across the river, and fastened to the opposite stones. Two small steam-engines are employed as the moving power, by turning a shaft, on each end of which there is a large cast-iron wheel, whereon the guide chains rest. The landing-places on each shore are simple inclined planes, from low-water mark to two feet above high-water mark, formed to a slope or inclination of one inch twelve or one inch fourteen; and as the bridge approaches, the drawbridge is lowered on the plane.

To prevent the chains being so tight as to interrupt the free navigation of the estuary, or to endanger their breaking, instead of being fastened or moored to the shores, their ends have heavy weights attached to them, in shafts twenty feet deep and sixteen feet square at the head of each landing-place, the weights being cast-iron boxes loaded with five tons each, attached to the ends of the chains, which enter the shafts over cast-iron sheaves of two feet diameter. These weights rise and fall as the strain upon the chains becomes more or less, and prevents the tension ever exceeding the balance weights, which are considerably below the weight to which the chains have been proved.

The length of the bridge, exclusive of the drawbridges, is sixty-five feet; the width at midships, forty five feet; and at the ends, thirty-eight feet six inches. The draught of water, when the bridge is full of heavy carriages, is rather under two feet six inches, the clear depth of hold being four feet three inches.

The seat of the bridge in the water, or rather the lines of floatation, are elliptic, and the sides are curved vertically, the object of these forms being to

relieve the bridge as much as possible from the effect of the current, and to prevent the sudden stoppage of a wave, and the consequent spray over the side.

The roadways or decks have cross battens to prevent the horses' feet from sliding, and also for the better holding of a thin coat of sand and tar, as a more agreeable footing than wood. The fencing of the sides of the roadway is complete, by carrying the timbers three feet six inches to four feet above the decks, and above that by the chains which suspend the drawbridges forming a rail.

The drawbridges are of the same width as the roadways, and are suspended by two three-quarter inch chains; one of which, as before stated, forms a guard-rail to the side of the bridge; the other passes through the engine-house, being there connected with a small purchase machine.

There are two steam-engines, each having a cylinder of nineteen inches diameter, and two feet six inches stroke. They are common condensing beam engines, working at a pressure of three and a half pounds per inch in the boiler, and at an average speed of thirty five strokes per minute, and but one boiler. The feeding water is procured from a tank on the eastern landing-place, and the waste steam being thrown into this tank, is sufficient to raise the water to 100°.

The guide chains are of the common cable pattern, each one inch iron, and each link made to a gauge, so as to fit the chain wheels without slipping When the bridge is on either side of the river, and the chains lie on its bed. and when the bridge is in the act of crossing, they necessarily form two arcs, The weights in the shafts rise and fall from five to eight feet, according as the weather and the tide may happen.

The time of the bridge crossing is seven minutes at low-water, and eight minutes at high-water.

On the Evaporation of Water from Steam Boilers; by Josiah Parkes.

This paper contains the result of various experiments, conducted with the view of ascertaining the quantity of water which can be evaporated under particular circumstances by a given quantity of fuel. The results are tabulated with great accuracy, and all the authenticated data known to exist on this subject are brought together in a form in which they may be generally useful.

The author was induced to make sundry experiments on the supply of fuel and of air to the furnaces of the engine, with the desire to consume or diminish as much as possible the smoke and soot emitted from the chimney.

The furnaces had hopper mouth-pieces, with a provision for admitting a thin stream of air over the mouth-pieces into the fire, in order to consume the smoke; but which was of very little service, as volumes of smoke rolled forth from the chimney at each successive firing. Heavier and less frequent firing was adopted, and at the same time a careful admission of air over the hopper into the fire; but still the nuisance remained undiminished.

From the researches of Sir Humphry Davy on the safety lamp and on flame, it occurred to Mr. Parkes that the air must be given directly to the uninflamed gas at the point of greatest heat, the temperature of incandescence being necessary for inflammation; whereas, formerly, the air had become vitiated by passing over inflamed fuel, and that the bridge of the furnace was the most fit place for the supply of air, as it would there encounter all the inflamed and uninflamed gas, and obtain at all times the temperature necessary for ignition. Previously to the necessary alterations of the furnaces, the duty done by the coals, as ascertained by the evaporation of water, was carefully registered.

In respect to the firing of the furnaces, the author had observed that somewhat less smoke was emitted from less frequent than from very frequent firing, and that somewhat more water was evaporated by the same weight of fuel in the former than in the latter case. Also, that in consequence of less poking, fewer cinders were made; the dampers were lower, as there was a greater mass, though less intensity of heat; and the temperature of combustion being less elevated, there were fewer scoriæ. The operations of firing were gradually diminished, until a mode of working the engine with two charges of coal per diem was arrived at, the furnaces being loaded in the morning as rapidly as keeping up the steam would permit, with sufficient coal to work the engine till dinner-time. The grates were then cleaned, and charged again during the dinner hour, requiring no more coal during the day. The results attending these alterations were most important, viz., economy of fuel, steadiness of steam, much less smoke, still fewer scoriæ. On the re-construction of the furnaces necessary for the admission of air at the bridges, the whole capacity of the furnaces were enlarged, that they might contain at once the entire of the fuel requisite for the day's consumption, At the same time the boilers were covered with double arches of brickwork, leaving an air space between each arch and the boiler, coating the outer arch thickly with strong hair mortar, mixed with waste of wool. Eye-pieces were also made in the walls at the end of the boilers, opposite the fire doors, to obtain a view of what might take place at the bridges on opening or shutting the valves; also eye-holes for the side flues, to ascertain how far the flame extended. The results were now of the most satisfactory nature, no smoke being visible from about seven in the morning. The dampers were very close down, and capable of keeping the steam so steady, that it did not vary one-eighth of an inch in height for many hours. The furnaces, when charged, may be considered as great reservoirs of fuel, in a constant, equable, but moderate, state of combustion, not the entire mass on fire at once, but distilling first its gaseous products, and then gradually entering into combustion.

The greatest evaporation which was obtained from 112 pounds of coal was 18·5 cubic feet, supposing the water to have entered the boiler at 212 degrees. This was accomplished with both Netherton and Newcastle coal, the Wednesbury giving something less; whilst, before the introduction of the above-mentioned advancement, twelve cubic feet was the greatest evaporation.

This method, which had been followed so successfully, was subsequently made the subject of a patent, and applied to above 500 furnaces; but has gradually fallen into disuse, from its not being worth the master's care and time to see that the firemen do their duty. The author details a conversation which he had with Sir Humphry Davy, who had been making experiments on the temperature at the bridge, and the gaseous products of combustion; during which, that distinguished philosopher gave it as his opinion that the plan could never be established in general practice; that it was too simple, and depended on the fireman and not on the master, who will not concern himself with saving a few coals; that the same was his safety lamp; one half of the miners will not use it, but persist in working comparatively without light, and in danger of explosion, rather than adopt a simple contrivance which requires a small amount of trouble and care.

The paper is accompanied by four tables, the first of which contains the experiments made by himself; the second, the results of the Cornish boilers, from Captain Lean's report; the third, those of locomotive boilers, from De Pambour's work; and the fourth is a comparative table of the mean, greatest, and least results of the experiments on the three classes of boilers. The temperature of the water being different in the various experiments, a common standard is introduced by calculation, and the numbers express the quantity of water of 212° Fahrenheit, which would be evaporated by a given weight of coal.

	Cubic Feet.
The mean value of 112 lbs. of coal in evaporating water of 212° Fahrenheit is in the Cornish boiler	21·16
Mr. Parkes' Experiments at Warwick	18·5
——— in Lancashire	13·49
Ordinary boilers, and system of firing	14
Locomotion	10

Thus the efficiency of boilers being measured by the quantity of water evaporated by a given quantity of fuel, it appears that the boiler of the locomotives is far the lowest in the scale, and of the Cornish engines the highest. The paper concludes with a review of the state of our knowledge on the application of heat, and on the value of different kinds of fuel.

The Land Surveyor's Calculator; by George Heald.

The instrument to which the above name is assigned, was invented for the purpose of avoiding the necessity of performing long arithmetical calculations in surveying estates, the results being given at once by the adaptation and inspection of the instrument, as directed. It may also be applied to extracting the square roots of numbers, and the other purposes to which Gunter's scale is applicable.

The instrument consists of five concentric circles, whereof the four inner ones are on the outer edge of a card, moveable about a centre, and the fifth or outer circle is fixed.

The circumference of the fixed circle is divided into 1,000 logarithmic portions, representing links, and numbered 10, 11, 12, at every ten divisions, which numbers represent 1 chain; 1 chain, 10 links; 1 chain, 20 links, &c. From 1 chain to 1·5 chains these divisions are each subdivided into five parts, which serve to indicate the proportional parts of a link.

The next circle, formed by the graduated edge of the moveable piece of card board, is in all respects similar to the first, save that the divisions are carried round in the opposite direction. The second circle on the moveable card board represents areas and decimals, commencing with half an acre, and proceeding up to five acres.

The next circle divided into perches, to correspond with the preceding decimal division. It is numbered at every ten perches, and the acre is expressed at the termination of every rood.

The last, or fifth circle, is to show the area in acres, roods, and perches: when it is under two roods, it is numbered accordingly.

The author then describes the method of using the instrument for the solution of questions similar to the following. Having the diagonal and the two perpendiculars of a quadrilateral, or the base and perpendicular of a triangle; to determine the areas of the respective figures. The result is known at once in acres, roods, and perches, on inspecting either the fourth or fifth circle, according as above the area is greater or less than half an acre.

The instrument may also be used to the computing square yards, to the extricating square roots of numbers, and the ordinary operations of multiplication and division in the same manner as on other logarithmic lines.

A great advantage of this instrument results from the graduation being on the circumference of a circle. Great enlargement of the divisions is thus obtained, and in a far more convenient manner than by drawing a slide, as on the common sliding rule. The diameter of the outer circle in this instrument is sixteen inches; and to obtain divisions of the same magnitude, a rule with its slide drawn must be eight feet four inches. The author considers that a circle of eight inches diameter would be sufficiently accurate for practical purposes, and would render the instrument extremely compact and portable.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At an Ordinary General Meeting of the Members, held on Monday, the 26th of February, 1838. J. B. PAPWORTH, Esq., V. P., in the Chair.

E. Lapidge, Esq., was elected a Fellow.

Several donations were announced as having been received.

Dr. Dickson delivered a lecture on the qualities of timber, and their application to construction.

T. L. Donaldson, Esq., Hon. Sec., described the sewer built under the Harrow-road, by the Great Western Railway Company, which had fallen in a short time since.

A communication was read from the Baron Wittersteaf, describing an anti-combustive mixture for the saturation of timber, so as to render roofs, floors, &c., less liable to ignition. The timber is to be placed in a vessel or trough, and hermetically closed, containing a solution of soda and water; the air is then to be exhausted by the aid of an air pump, and left for a period of six or seven days, when the atmosphere is to be re admitted; after remaining for a short time, the timber is to be taken out, when it will be found to be completely saturated with the solution, which consists of four to five pounds of soda, mixed with one gallon of fresh water. It will be better if the timber or deals be immersed in the solution after they are planed, or prepared for framing, and before they are glued up.

If cotton cloths, or other inflammable materials, be dipped once or twice in the solution, and mixed with a small portion of starch or glue, gum arabic, gum dragonant, &c., they will not inflame; but for wood no addition must be made of such glutinous substances, as they will prevent the liquidity of the solution, and impede the absorption in the fibres of the wood.

At an Ordinary Meeting of the Members, held on Monday, March 12, 1838, P. F. Robinson, Esq., V.P., in the Chair.

The following Gentlemen were elected as associates:— A. S. Hiscocks, of 83, Blackman Street, Boro'; Herbert Williams, Tonbridge Place, New Road. Several donations were announced as having been received.

A very interesting paper was read by George Godwin, Jun., Associate, on "The ruins of the Abbey of St. Bavon, at Ghent," in reference to the style of architecture known in England as Saxon and Norman, illustrated with sketches of the building.

Mr. R. H. Renton delivered an introductory lecture on the "Nature and Properties of Iron."

At an Ordinary Meeting of the Members, held on Monday, March 26, 1838. EARL DE GREY, President, in the Chair.

The following Gentlemen were elected as Fellows—*Thomas Fulljames*, of Gloucester; *William Rogers*, Palace Chambers, Lambeth.

As Associates—*C. A. E. Blair*, of Reigate; *Henry Clutton*, of Vernon Place, Bloomsbury.

Several donations were announced, among which was a Bust of the late Mr. Park, Architect, presented by Mr. Scoles, Fellow.

Several letters were received from Foreign architects who had been elected Honorary Members, and presented with the volume of the Institute's Transactions, expressive of their thanks for the high honour conferred on them.

Dr. Dickson then delivered the fifth and concluding lecture "*On the qualities of Timbers.*" The present lecture was principally confined to the decay of timber by fungi, dry rot, and the prevention of decay. He entered very fully into Mr. Kyan's process of preparing timber, by immersing it in a solution of corrosive sublimate, as a preventative of the dry rot; he explained in what manner it acted as a preventative of the dry rot; he stated that the corrosive sublimate solidified or coagulated the albumen, more particularly the sap wood, thereby preventing the fermentation of the wood and the development of fungi. We intend, in our next Journal, to give a brief abstract of the lecture.

The Noble President then called the attention of the Meeting to an important part of the proceedings of the Society, it having devolved on him, as President, to present the prizes to the successful candidates, awarded agreeably to the resolution of the Council, and confirmed by the Members at a meeting held on the 12th of February last, as reported in our Journal of last month, page 140, to which we refer for particulars. The several candidates, Mr. Samuel Sharp, Associate, Mr. George Edward Laing, and W. W. Pocock, Associates, were present. The Noble Chairman, in a very appropriate speech, presented to the former the Soane Medallion, and to the other two gentlemen the Medals of the Institute. The Institute passed unanimously a vote of thanks to *Mr. Andrews*, Fellow, of York (the unsuccessful candidate for the Soane Medallion), for the handsome manner he had acted in presenting to the Institute his Essay and Drawings of the restoration of the Abbey of St. Mary, at York.

At the conclusion of the business of the evening, the Noble President invited the Members and the Company present to his house on Monday evening, April 2nd.

ARCHITECTURAL SOCIETY.

Ordinary Meeting of the Society, held at their Rooms, 35, *Lincoln's Inn Fields*, 27*th of Feb.* 1838. T. H. WYATT, Esq., V.P., in the Chair.

Mr. Fripp, of Abingdon Place, Westminster, lately elected a member of the Society, forwarded his presentation drawings, agreeable to the laws, consisting of a design for "Scott's Monument," and a design for a "Park Entrance."

The ballotting for the sketches produced at the last meeting by the student members then took place. After which, the chairman called the attention of the members to the sketches the students member had produced this present evening, in competition for the prize to be awarded by Mr. George Mair, at the end of the session.

The subjects for the sketches proposed to be produced at the next meeting were announced—For members, "A design for an entrance to a palace;" for students, "A design for a gateway to a town entrance, with two side or foot-passengers' pathways; outer gateway to be 18 feet wide; side entrances, 6 feet wide, to be drawn to a ¼ scale, and tinted in lessia."

Monthly Meeting of the Society, held 13th of March, 1838.—*T. H. Wyatt, Esq., in the chair.*

The ballotting for the sketches commenced the business of this meeting, after which, those which had been prepared for this evening were produced for the consideration of the members.

Mr. John Woolley then read a highly interesting paper, offering sundry remarks upon the re-building of the Royal Exchange. Some sketches, principally of ornaments, were produced by Mr. John Henry Hakewill, which attracted general attention.

The subjects for the sketches proposed to be produced at the next meeting were announced as follows:—For members, "A design for a monument to Lord Nelson, adapted to the site of Trafalgar Square;" for students, "A design for a toll house, in the Tudor style, consisting of two rooms, besides a small portal, showing gates thereto."

A Special Meeting of the Society was held the 16th of March, 1838, for the transaction of private business, when it was announced that H. R. H. the Duke of Sussex had condescended to become patron of the Society, and a deputation was appointed to convey the warmest thanks of the members to this distinguished individual for the high honour which H. R. H. has thus conferred upon them.

ROE'S PATENT CLOSET BASIN.

SIR,—In the notice of my Patent Closet, in your last Journal, page 141, you say the principal improvement is in the cock, &c.; this is not the case, as the principal improvement (for which I have taken out a patent) is in the basin, and is the only part which gives a decided superiority over the common closet. I consider the cock is an improvement upon the common one, but that is a secondary affair. The closet is not always supplied by means of a cock, but can be supplied in different ways. *See advertisment.*

Camberwell Road, March 7th, 1838. F. ROE.

MEETING OF SCIENTIFIC SOCIETIES.

Civil Engineers' Institute every Tuesday evening.
Royal Institute of British Architects, Monday evening, April 9 and 23.
Architectural Society, Tuesday evening, April 10.

STEAM NAVIGATION.

New Steamer.—The Dublin company's new vessel, the "Duchess of Kent," arrived on the 1st day of March at the quay, on her first voyage. She is a beautiful vessel, of the same power and mould as the "Queen Victoria." The "Duchess of Kent" arrived at Kingstown in ten hours and forty two minutes from the docks at Liverpool. This fine vessel will, on being registered, continue to ply regularly between Dublin and Liverpool. The company's next new steamer, the "Royal Adelaide," is expected in Dublin immediately, when she will take up the line between this port and London. The "Royal Adelaide" is equal in every respect to the "Royal William." Two new steamers (already far advanced in building) will succeed the "Adelaide," and are expected to be ready for sea in the ensuing summer.

Glasgow.—The steam-ship "Commodore" has commenced sailing from the Broomielaw for Liverpool. We learn that this splendid vessel is the first of a train of similar vessels which her enterprising owners, the City of Glasgow Steam Packet Company, intend putting on the Liverpool trade; also, that both in build and machinery she is materially different from any other. Her quarter-deck, by extending over the engine-room, leaves a promenade of fully 150 feet in length—while a decided advantage is obtained in a mechanical point of view by allowing more space for the engines. It is expected, from the trial trips made, that she will not be surpassed by any vessel now afloat.

We understand that a direct steam-packet communication with Sweden is on the point of being re established between the ports of Hull and Gothenborg, the Swedish Charge d'Affairs in this country having entered into a contract with an English company for the conveyance of the mails.

Steam Navigation to New York. There is now fitting out in the port of London a steamer, which is intended to make the first experimental trip to New York. She is named the Columbus. She will be propelled by Mr. Howard's Patent Vapour Engines, and can carry fifty days' fuel at the same immersion as a steam vessel on the common plan, of equal power and tonnage, can carry twelve days' fuel. She will sail from the Thames for the Mersey as soon as the former river shall be free from ice, and will leave Liverpool shortly afterwards for New York.—*Liverpool Standard.*

An iron steamer, named "The Caledonia," built by Messrs. Carmichael, was launched from their works at Sea Braes on Wednesday week, in presence of a large number of spectators. She is the first iron vessel built here, and in regard to mould and workmanship does the utmost credit to her builders. She is to be fitted up with two engines of thirty-five horse power each, and is admirably adapted for river navigation.—*Montrose Review.*

The Columbus, an experimental steam boat, fitted for generating steam through the medium of quicksilver, and intended to supersede the use of coal to a considerable extent, put in here from Weymouth, on a cruise round land. The masters and officers report favourably of the principle so far.—*Jersey News.*

PROGRESS OF RAILWAYS.

Lancaster and Preston Railway.—Contracts for laying and completing the entire line of road will shortly be completed. Large purchases of land have also been made by the company, but some difficulty having been experienced in treating with certain owners of property on the line, it is not unlikely that a jury will, ere long, be summoned to assess the value of the land in question.—*Lancaster Guardian.*

The Midland Counties Railway.—When the frost takes its departure 3,000 men will be set to work between this town and Rugby, in the formation of the railway: the line, it is expected, will be opened in 1840.—*Leicester Chronicle.*

Great Western Railway.—The Directors have concluded contracts for the entire completion of the great tunnel at Box-hill, according to the plans and specifications of the engineer, Mr. Brunel. Although attended with far less difficulty, as an engineering work, than some of the tunnels now in execution upon the Birmingham line, the Box tunnel will prove one of the finest specimens of scientific skill and boldness which this country can exhibit. The permanent and temporary shafts have all been completed, and of course afford the most satisfactory proof of the nature and quality of the ground, which proves to be far more favourable in every respect than was anticipated. The larger portion of the tunnel will be through the oolite or Bath stone, and the remainder through a firm dry marl, which offers little difficulty in working. The Directors, we think, did wisely in giving the contractors such ample means of ascertaining the nature of the materials they have to encounter, as they have thus been enabled to secure the completion of the work on terms closely corresponding with the engineer's estimate, and not influenced by the exaggerated apprehension of difficulties which ignorance of the strata might create. The contracts have all been taken by Mr. George Burge, of Herne Bay, who is well known as contractor for the St. Katherine Docks, London, and whose high character for responsibility, energy, and skill, is sufficient assurance to the Proprietors that he will execute his contracts to the entire satisfaction of the Directors, and with the spirit and fidelity manifested in his former undertakings.—*Bristol Gazette.*

The Manchester, Bolton, and Bury Railway, it is said, will be completed the entire distance by the first day of May.

The Grand Junction Railway Company have made an application to Parliament for power to make a diversion from the present line, considerably southwards of Warrington (crossing the river at Fiddler's Ferry), to Liverpool.

Bristol and Exeter Railway.—The state of this line is now become very interesting from the vigorous prosecution of the works on the first twelve miles. Another powerful locomotive engine arrived this week, which will be running on the line near Backwell on Monday; and we understand the Directors and a large party of shareholders intend proceeding over the line, commencing with Pile hill on the Bath road, and ending with Backwell.—*Bristol Paper, March 3.*

Hull and Selby Railway.—This important undertaking is rapidly progressing. The embankment on the west side of the Market Weighton Canal, about one mile in length, is nearly completed. The embankment on the east side of the canal is commenced; the foundations for the flood arches, on the west side of the canal, are excavated, and the sheet piling is finished. The abutment and wing walls of the bridge over the Ouse, on the Selby side, have been raised to the point of the springing course for the iron arches, and the pier piling next to the abutment is driven down. The foundations of the abutments on the Barlby side are excavated, and the piling is commenced.

Sheffield and Rotherham.—Of this railway, the greater proportion of the masonry and bridge work has been completed; and the state of the works, and of the arrangements generally, is such as to leave no doubt in the minds of the directors, that the whole of the line into the town of Rotherham, as well as the connecting branch with the North Midland Railway and Earl Fitzwilliam's collieries at Greasborough, will be opened in August next.

Havre and Rouen Railway.—Letters received from Paris mention that a company had been originated, which it was expected would have the sanction of government, for the formation of a railway from that city to Havre and Rouen. The subscriptions had been nearly completed, and we understand that the shares allotted for distribution in London have also been taken up.

Taff Vale Railway. The directors state, that with regard to the works, they have given priority to the contracts which would necessarily require the longest period for their completion, such as the viaduct over the Taff river and valley at Geedre-y-Coed, the bridges over the Taff and Rhondda, at Melin Griffith and Dewbridge, together with the tunnels at Geedre-y-Coed and Yniscoy. The directors have, in addition to these works, entered into other contracts, including two more bridges over the Taff, the whole of the Merthyr and Melin Griffith embankments, and all the important works upon the main line of railway. Three more contracts have also been advertised, tenders for which were to have been received on the 7th of March. These fifteen contracts comprise the whole of the main line from Merthyr to Cardiff, with the exception of a few miles, the contracts for which are in course of preparation.

Havana Railway.—This great work was promoted and undertaken by the desire and influence of the Superintendent-general of the Royal Finance, in consequence of the great obstacles which a want of good roads was daily opposing to the commercial operations of this emporium of the Western Islands, and of the considerable expenses which the maintenance of the common roads, if ever so good, might occasion in a climate naturally damp, and the soil of which is so very soft and deep. He conceived, therefore, the idea of constructing a railway not inferior in solidity and magnificence to the best in England. The constancy with which his Excellency has persevered in his object, until he saw it accomplished, by removing obstacles and facilitating the necessary resources, is worthy of the highest praise. The whole of the railway intended to the town of Guines will be completed by May, 1838.—*Diario de la Havana.*

York and North Midland Railway.—Out of eight and a half miles from York, the land for seven miles is already purchased. The average price of it for the York station (eight and a half acres) is 335*l.* 14s. per acre, including all claims for compensation, severance, &c., but the remaining sixty acres average only 95*l.* per acre. Six thousand stone blocks have been contracted for, at 4s. each; 7,000 sleepers, at 3s. 4d. each; 300 tons of iron rails, at 11*l.* 10s. per ton; and sixty tons of chairs, at 8*l.* 10s. per ton. Fourteen and a quarter miles of the Leeds and Selby Railway is expected to be completed early in 1839.

The London and Birmingham Railroad.—On Thursday, 15th inst., a number of surveyors, engineers, and gentlemen connected with the London and Birmingham Railroad, proceeded from Euston Grove entrance to Tring, from whence they were to proceed to Denbigh Hall, a further distance on the line of works of seventeen miles, for the purpose of trying the solidity of the road, which will be opened from Euston Grove, St. Pancras, to Denbigh Hall, a total distance of forty-eight and a half miles from London, on Wednesday, the 21st instant. On the Birmingham Line towards London, the distance completed to Rugby is thirty miles. Denbigh Hall is situated four and a half miles from Woburn, and three from Brick-hill.

Grand Caledonian Junction Railway.—In addition to the opinion of Mr. Stephenson, the engineer, relative to the practicability of forming embankments across Morecambe Bay and Duddon Sands, we can now add the united testimony of Captain Beasley and Mr. Haig, two gentlemen who have had much experience in similar undertakings, both in Lincolnshire and in Holland. These gentlemen have just completed a minute examination of the two estuaries in question, and, like Mr. Stephenson, concur in pronouncing the scheme not merely practicable, but easy of accomplishment. This stumbling block, with many, in the way of the formation of the Grand Caledonian Junction Railway, may now be said to be completely removed, and having thus cleared the way, progressive steps have been determined upon. At a meeting of the most influential gentlemen in the neighbourhood, held last week at Gillfoot, the seat of Thomas Hartley, Esq., to deliberate on this important question, it was determined that a public meeting should be held in this town on the 5th of next month, for the purpose of entering into a subscription to defray the cost of a survey from Lancaster to this town, and arranging other matters for carrying the measure into effect.—*Cumberland Pacquet.*

Grand Junction Railway. An accident has occurred upon the line near Preston Brook, by the giving way of part of the tunnel at that point, owing, apparently, to a fault or slip under ground, which caused a pressure upon the brick work that it was not calculated to sustain. The fall took place on the evening of Saturday, but was attended with no worse consequences than the detention of the trains, the passengers in which will have to change carriages, and walk for about 150 yards, until the debris can be removed. The passenger train and mails will be dispatched as usual, but gentlemen's carriages, horses, and goods, cannot be forwarded beyond this point until the communication is restored, to effect which the utmost exertions are being used.—*Liverpool Albion.*

Birmingham Railway.—We regret to learn that about seventy yards of the railway tunnel, at Kilsby, fell in on Monday last. Fortunately the labourers were absent at the time, and no accidents occurred. On Sunday, a railway bridge, called Folly Lane Bridge, near Coventry, also gave way.—*Northampton Mercury.*

Birmingham and Gloucester.—We learn that an arrangement has been made with the Cheltenham and Great Western Union Railway Company, that clauses shall be introduced in their bill now passing in parliament, giving power to the Birmingham and Gloucester Company to make the line between Cheltenham and Gloucester, if the Cheltenham and Great Western Company fail to do so within a given period; and the public are, therefore, now secure of having that important portion of the line formed within a moderate time, and, consequently, the whole line between Birmingham and Gloucester completed.

Great North of England Railway.—The third half-yearly general meeting of this company was held in Darlington, on Tuesday, the 27th of Feb. A full report was read to the meeting of the contracts made, and the progress of the works which had been commenced from the passing of the act, in the month of June, 1837, to December 31, detailing also the manner in which the works are intended to be prosecuted during the present year, and giving tabular statements of the receipts and disbursements to the end of the last year. The principal points embraced in the report were as follows:—That the most strenuous exertions of the company have been directed to putting into execution the line between Darlington and York, so as to open a communication with London and the manufacturing districts at the earliest period possible, and, that as soon as the funds of the company will allow, the line will be continued northwards, so as ultimately to reach Newcastle.—*Tyne Mercury.*

Blackwall Railway.—The detail survey is completed, the line marked out, and drawings preparing for the contracts, which are expected to be ready in June next. The notice to the tenants will be served forthwith. It is intended to carry the viaduct on arches of 28 feet span. Several of the bridges over the roads will be of iron, in the form of the bow-string arch, 70 feet span. It is not intended to have a parapet, but instead, a neat open ornamental iron railing, which will give the viaduct a light and pleasing effect. The whole of the Brunswick Steam Wharf is to be covered with a shed, with a neat ornamental iron roof.

London and Portsmouth Railway.—The Parliamentary plans for this railway have been lodged with the Clerks of the Peace. The line proposed will be that portion of Stephenson's Brighton Railway, between the Southampton Railway, at Wimbledon Common, and Horsham, where it will diverge to the south-west, and pass through or near the towns of Chichester and Arundel. The gradients are very favourable, a distance of forty miles is on a dead level.

Manchester and Birmingham Railway.—That part of the line between Manchester and Stockport is marked out, and the drawing prepared for commencing active operations in June next. It is also intended to apply, next session of Parliament, for extending this railway from Stone to Rugby, thereby saving a very circuitous route, and considerably shortening the distance between London and Manchester. This line looks well on the map; it will, we have no doubt, be a very formidable rival to the Grand Junction Railway.

Midland Counties Railway.—About 1,000 men are employed on the line between Nottingham and Derby, which is expected to be open for traffic in the spring of 1839; and the line between Leicester and Rugby will be finished in the summer of 1840.

The South-Eastern Railway.—The progress of the work in this neighbourhood has been marked by a considerable advance since the alteration of the weather has permitted the workmen to extend their operations, which now indicate a determined perseverance towards the completion of the grand Shakspeare tunnels. The cliff will preserve its elevation undisturbed, 370 feet above the level of the sea. Beyond the Mulberry Tree public-house, an angular face has been given to the cliff for the commencement of the tunnels; each of which, it appears, will be twelve feet wide by thirty feet in height. The chalk and earth excavated by this cutting is enormous; and has been formed into a platform 30 feet above high-water mark, presenting the apparent level of the intended road. Over the line of the tunnels, seven shafts, at a probable distance of 160 yards, have been sunk to a considerable depth; and from the bottom of each of these shafts a gallery will be driven to the face of the cliff—thus opening to the sea, and having a constant supply of light and air. Half way down the slope of the hill, towards the old Folkestone road, an observatory has been erected for the service of the engineers; and on a similar inclination, but nearer to the town, the first of the shafts is sunk. The last of these sinkings, which are eight or ten feet in diameter at the surface, is near the base of the Round Down, where the tunnel will terminate; and from thence the cliffs have been scarped to a ledge, on which it seems the railroad will run towards Lydden Spout, and the Double Cliffs in Eastware Bay.

Proposed Line from Crookhaven to Dublin.—Much attention has lately been attracted in London to a project which is reported to be afloat, for the formation of a line of railroad from Crookhaven to Dublin, as a means of a much more rapid communication with the United States and our West Indian provinces. The substance of the plan consists in a direct line of road from Crookhaven to Cork, and thence to join that of the Dublin and Kilkenny, which has already been formed, and has been proved to have many natural advantages as regards the proximity of materials for its construction, and a most perfect level.

Newcastle and Carlisle Railway.—Messrs. Grahamsley and Co. has entered into a contract with the directors of the Newcastle and Carlisle Railway for the formation of the remainder of the line from Scottswood to Newcastle, to be executed before the end of the present year.—*Liverpool Journal.*

ENGINEERING WORKS.

Ireland.—A new bridge is to be erected at Belfast, on the site of the present Long Bridge. The plans are from Messrs. Woodhouse and Fraser, Civil Engineers. The bridge is to have five arches, each fifty feet span, with ten feet rise from the springing; the first arch to be about one hundred feet from the Antrim bank of the river, so as to allow sufficient space for increasing the width of the present quayage, and securing an easy approach from Chichester-street, High-street, and Ann-street. The roadway between the parapets is to be forty-two feet in width: the inclination of the approaches will not exceed one foot in thirty-five.

Thames Tunnel.—The works are now proceeding with great activity. Since the last irruption the shield has been considerably advanced, and the tunnel has been lengthened fourteen feet. The miners feel great confidence, and for some days past the excavations have proceeded with more than usual rapidity. Two gun-brigs are about to be moored over the bed of the tunnel, where the works are in progress, to prevent any interruption from vessels in the river anchoring over the place. The people on the Rotherhithe and Wapping shores are in anxious expectation of a communication being opened between these two places under the river, and the consequent improvement of property in those parishes, which has much diminished in value since the termination of the war. Should the works of the tunnel advance only in the same ratio as they have done during the last few weeks, low-water mark on the Middlesex shore will be reached by the end of the summer, all danger of another visit from the Thames will be at an end, and the completion of the tunnel will take place in a very short time.

Thames Tunnel.—Another Irruption of the River into the Tunnel.—At half-past six o'clock on Tuesday morning, March 20, the appearance of the ground, and an unusual noise, as if from a rushing of water into a cavity having taken place, the engineer's attention was drawn to the peculiar circumstances, and he therefore anticipated a rush of water. Mr. Mason, one of the assistant engineers, who was then just going on duty, with some active miners, attempted to take means to prevent an irruption, but finding it useless, he thought it necessary to order the workmen to retreat, and which they did in an orderly manner, by the safety-platforms erected by Mr Brunel for the passage of the workmen in case of danger, and they ascended to the top of the shaft without any personal injury having happened to a single individual, although between sixty and seventy persons were in the works at the time. In about a quarter of an hour afterwards, the water gradually filled the tunnel. Active operations were immediately commenced for filling up the aperture in the bed of the river, as a quantity of clay had been already collected near the spot, for the purpose of forming the proposed covering towards the north shore, and which is not yet completed.

NEW CHURCHES.

Church at Staley Bridge, Chester.—The corner stone was laid on the 2nd Feb., with masonic honours, by Lord Viscount Combermere. The church is situated upon a plot of land containing not less than five acres, and most beautifully situated with reference to the delightful scenery of the surrounding country, and will render the church a conspicuous and pleasing land-mark. *The church* will be in that style of architecture which prevailed towards the close of the thirteenth century, as beautifully exemplified in the Cathedrals of Salisbury, Lincoln, and York, and also in Beverley Minster. The leading features of the design are a lofty nave in the centre, lighted from clerestory windows with aisles on the sides, lighted by coupled lancet windows between the buttresses. The tower is placed at the west end of the nave, and is in four stories or compartments in height. In the first story is the west entrance, which consists of a bold recessed doorway. In the second story of the west front is placed a neat two-light window, with elegant tracery. The next story is formed by neat panelling for clock dials on three sides of the tower. The last story is formed by two narrow lancet belfry windows on each face of the tower. Each angle of the tower is flanked by double buttresses; above the latter rise four octagonal turrets with shafts at their angles supporting canopies over their faces, the whole surmounted by lofty pinnacles terminating in appropriate finials, the highest part of which will be eighty-eight feet above the ground line. The east end of the nave projects beyond the ends of the aisles to form the chancel, the external angles being flanked with bold double buttresses, in one unbroken height, having large attached circular shafts at the angles, and terminating in large plain canopies; above these are placed two large octagonal turrets, having a rich corbel table round their upper parts, surmounted by lofty pinnacles terminating in plain nobs as finials. The east end of the nave or chancel is pierced for a neat four-light window, formed of rich and elegant tracery, similar to a part of the window in the east end of Lincoln Cathedral. The chancel is flanked by two small buildings, one of which forms the vestry or robing room, and the other a porch to the east entrance to the church; the east front of these buildings is pierced with small coupled lancet windows. The sides of the aisles are divided by buttresses into five compartments, with double buttresses at the external angles. In each compartment are coupled lancet windows. The upper part of the aisles finishes with a cornice, over which rises the parapet, finishing with a coping. The clerestory is divided into compartments by flat buttresses ranging with those to the aisles, above which is a cornice and parapet similar to what has been described to the aisles. The clerestory windows are in the form of spherical equilateral triangles filled in with neat tracery; the authority for this description of window may be found in the upper part of the aisles to Westminster Abbey, and in the clerestory of Litchfield Cathedral, as well as in a few of our parochial churches in the west of England. The whole of the church is to be built of stone of a very hard and lasting quality, faced with neat hammer-dressed walling, and having tooled ashler dressings to all the doors, windows, &c. The extreme length of the building will be one hundred and two feet, and the width fifty-seven feet. The church is divided into nave and aisles, the latter being separated from the former by five arched compartments on each side, supported on solid octagonal stone piers with moulded capitals, from which spring stone arches that support the clerestory. The west end of the nave is open by a large archway to the interior of the tower. The nave is to have a groined ceiling, with moulded ribs upon all the intersections of the vaulting, stopping upon moulded stone corbels. There are to be galleries in the aisles and at the west end of the nave. The interior will contain sittings for one thousand and six persons, three hundred and sixty of which are free. The greater portion of the free sittings are in pews, and not in open skeleton seats, as is usually the case in the government churches. There is ample room for an organ of adequate size. There is also provision made for warming the building with hot water. It is expected that the church will be completed by March, 1839. The total cost of the building, including architect's commission, &c., will be about 4,100*l.* The architect is R. Tattersall, of Manchester.

Arbroath.—A new church was opened here in January last, built by subscription, and connected with the establishment, designed by Mr Charles Ower, of Dundee, who gained the premium of fifteen guineas, his plan being the best of sixteen that were presented. It contains 1,100 sittings, and cost little more than £2000. The principal part, which is close on the road leading from Arbroath to Dundee, is in the Grecian style. The interior is very commodious, and the whole has given every satisfaction to the subscribers.

The New Church of St Luke, Berwick Street.—The ceremony of laying the first stone of this sacred edifice took place on the 15th instant. The stone was laid with the usual ceremony by Earl de Grey. The expenses of the building are estimated at about 14,000*l.* The sum collected amounts to nearly 12,000*l.*, leaving a deficiency to be supplied by further voluntary subscriptions. The grant from the Church Commissioners is only 2,500*l.* The plan of the building is in the pointed English style, with pinnacles, flying buttresses, and raised roof. Mr. Blore is the architect, and Messrs. Grundy and H. Hartley the builders.—*Morning Post.*

PUBLIC BUILDINGS AND IMPROVEMENTS.

THE ROYAL EXCHANGE.

A Court of Common Council was held on the 8th of *March*, for the purpose of receiving a report from the Royal Exchange and Gresham Committees, on their proceedings. Mr. R. L. Jones brought up the report of the Committee appointed to consider what was best to be done with the Gresham Trust, and to confer with the Mercers' Company as to the views they entertained of it, in consequence of the destruction of the Royal Exchange. The Committee feeling, from the great increase of commerce, and the alterations in the mode of carrying on the trade of the country since the Royal Exchange was built, that the public would expect a new Exchange to be erected upon a more extended scale, with a different arrangement of those parts not required for the general assembly of merchants and others; and that the streets and passages about the Exchange, particularly on the north side, from its contiguity to the Bank of England, should be considerably widened and improved, and that neither the public nor the court would be satisfied if the opportunity afforded by the fire were not taken advantage of, proceeded to consider and agree to the following suggestions to the Mercers' Company.—

"To rebuild the Royal Exchange upon an enlarged scale, and so as to afford increased accommodation to the mercantile interests. To improve the approaches, and to render the building in all respects worthy of the metropolis; for which purpose it would be necessary to take down the whole of the Bank Buildings, and a number of houses between Cornhill and Threadneedle Street, on the eastern side of the present site. That as the new Exchange may be erected for the sum of 150,000*l.*, that sum should be paid by the Corporation of the City of London and the Company of Mercers, in equal proportions, they being reimbursed (after paying the lecturers and other trusts) out of the future surplus monies of the Gresham estates; the Gresham trustees to give up to the public so much of the ground now forming part of the site of the Exchange as shall be required for the public convenience; and in lieu thereof the site of ground on which the proposed Exchange and buildings shall be erected, do become part of the Gresham trust; and as all the outlay beyond the sum of 150,000*l.* will be rendered necessary for the public convenience, and not for the benefit of the Gresham trust, it will be necessary to make an application to the Government for a grant of money sufficient for the purpose, which it is calculated will not exceed 200,000*l.*"

Sunderland.—Arrangements have been made for building an Exchange, together with a news' room and library over, and a museum in the top story; a committee has been appointed for purchasing the ground, and to advertise for architectural plans and designs.

Woolwich Dock Yard.—Messrs. Grissell and Peto has obtained the contract for building an extensive engineers' workshop, &c., to be built by Government near the new basin at Woolwich

Royal Exchange.—It is generally expected that the committee will advertise for competition drawings for the new building.

National Monument.—A meeting has been held and resolutions adopted with the view of erecting, by means of a public subscription, a national monument in a conspicuous part of the metropolis, to the memory of the gallant Earl Nelson, to commemorate his glorious achievements. Sir George Cockburn, Sir Pulteney Malcolm, Sir T. M. Hardy, Sir T. B. Martin, Sir Robert Otway, Sir Charles Adam, Sir Thomas Trowbridge, Sir Wm. Parker, Sir Augustus Clifford, the Hon. Captain Sp[illegible]r, and Sir Ch[illegible] Bulle[illegible] ori[illegible]tors of the design. The Fo[illegible]

Secretary to the Committee is Mr. Charles Davison Scott, son of the late John Scott, Esq., who was secretary to the Admiral. Trafalgar Square is spoken of as an appropriate site.

Kingston.—An addition, with a new front to the north elevation of the Courts, is now erecting under the superintendence of Charles Henman, Esq., Architect, A.I.B.A.

Kingston.—The Corporation have decided upon erecting a New Town Hall in the centre of the Market Place; the design is in the Italian style; the size 58 feet by 45 feet; the lower story is to be faced with Portland stone, ashlar, the cornices and dressings of the upper story to be of Bath stone. The tender of Mr. Trigg, of Kingston, for 3,832*l.* being the lowest, has been accepted. The design for this building was made by, and the superintendence is intrusted to, Charles Henman, Esq., Architect, A.I.B.A.

St. John's, Newfoundland.—The Government advertised for competition drawings and designs for building a new Town-hall and Market-place, offering three premiums of 50*l.*, 30*l.*, and 20*l.* The drawings of the following architects were received, to whom the premiums were awarded:—Mr. Inman, the first premium; Mr. Grellier, the second premium; and Mr. Finden, the third premium.

THE VICTORIA STEAM-SHIP.—CORONER'S INQUEST.

On Monday evening, 19th of March, Mr. C. J. Carttar, the Coroner for Kent, and a respectable jury, assembled at the Mitre Tavern, in Greenwich, to investigate the circumstances attending the deaths of William Thompson, Robert Brock, and Thomas Walker, who were killed by the explosion of a steam-boiler on board the new Hull steam-ship, the Victoria, on Friday, the 16th of March. Thompson died on board the steam-vessel, the others died on board the Dreadnought hospital ship, whither they were taken after the unfortunate accident.

The jury having been sworn, the coroner addressed them at considerable length. They then proceeded to view the three bodies. On their return, Mr. Charles Bell, the commander of the Victoria steam-ship, was called in and examined. He stated, that the new steam ship, of which he was master, was 816 tons burden, old measurement. She may be 1,200 tons, including her engines, and all together He believes her power to be 380 horse. She has two engines. Left Hull on Saturday, the 12th of March, and came to London direct by the aid of her engines. Nothing particular occurred on the voyage except, as is usual in new steam ships, he could not get the speed he wished, owing to the feed pumps being choked by the chips and other substances getting into them which had been left by the carpenters and other persons employed in the construction of the vessel. The ship got into the river without damage. We went direct to the Custom house quay. Arrived thereon Sunday at midnight. Left there again on Thursday last, between one and two o'clock, and proceeded to Blackwall. There were employed four firemen and two coal trimmers. The accident occurred when we were down in Halfway-reach. At the time I was on the starboard paddle box, and the pilot was on the larboard paddle-box. Had a regular pilot on board. Never go up and down the river without one. The first intimation we had of the accident was the noise of the steam issuing from under the paddle box. He saw the steam and smoke coming out of the first engine-room, and a collier-brig at the same time hailed him. The engines did not discontinue working. On ascertaining something was wrong, he jumped on to the top of the cook-house, and snatched off the weight on the safety-valves, which cleared off the steam. He then got into the engine-room and stopped the engines. When he got down to the engine room it was up to his ancles in hot water. * * * *

In the course of an hour and a half witness and Mr. Napier inspected the engine-room to ascertain the cause of the accident. The boiler was then very hot. He caused the fires to be raked out, and went into the flues, having first put on a dress for that purpose. There was nothing to be seen externally, but internally he found that the inner flue had burst, and the back partition, forming the back of the fire, was blown out. The iron bars of the grates were also blown away, and with the steam, scalding water, and fire, forced into the engine room. Witness was of opinion that the cause of the accident was owing to there being not a sufficient quantity of water in the boiler. It was the duty of the two assistant engineers purposely to look after, and report to, the chief engineers. The names of these men are Thompson and Walker, who are both dead. When we left Blackwall on Friday morning, the crew were quite sober.

William Napier examined.—He stated that he was an engineer, residing at Blackwall. The engines were made from his design. There was nothing peculiar in the engines or boilers. The boilers were made by the proprietors at Hull, they were tested to his satisfaction. The boilers were tested at 50lbs. to the square inch. She was intended to be put to 10lbs. per inch, he considers a boiler tested at 30 and put to 10, is safer than any others used in the country He had inspected the boilers since the accident, and on being asked what was the cause of the accident, said the flues of the boilers were pressed down in consequence of its being overheated, and it was from want of water.

It was the unanimous wish of the jury to postpone the verdict until Allen is sufficiently recovered to give some explanation about the matter; they also wished to have some professional and experienced man to inspect the steam ship, in order that they may obtain some further information as to the construction of the engines and boilers.

It was then arranged that Mr. Penn, jun., the engineer, should examine the ship for the purpose stated, and the inquiry was adjourned for a few days.

Adjourned Inquest, March 27th.

The captain was recalled, and the examination then proceeded.—The Victoria (he said) was tried five different times in the Humber; with one exception, they were working ten or eleven hours. The steamer was four times under way, and once she was tried while at anchor On one of these occasions there was an accident, by one of the pistons in the cylinder breaking. There was no difficulty in feeding the boilers with water.

Mr. William Napier, engineer, recalled.—The boilers, as well as the engines, were made from my designs; the boiler is a plain cylinder; the fire is contained under the boiler, and there is an opening at the extremity. He explained that the flues were formed round the boilers; and between the casing of the flues, and the outside of the boilers containing the water, there was a space of two and a half inches at the side, and six inches at the top and bottom. The outside and inside plates are an inch and a quarter thick. I have made similar engines for the Chieftain, which runs to Portugal; they are not quite so large as those in the Victoria, but there is only an inch and a half between the casing of the flues and boilers.

Examined by Mr. Russell, a juror.—In 1835, the Earl Grey steam-vessel exploded on the Clyde; that steamer belonged to me; I sold my premises at Glasgow, and gave up my business, in consequence of the disaster; the boilers in that vessel were not the same as those in the Victoria; the former contained common square boilers, and the Victoria contained circular boilers; they were the best boilers that could possibly be made, and just as I should make again.

By Captain Rowland, the harbour-master, one of the jurors.—I don't know whether the test-cocks are placed at convenient distances from the flooring of the engine-room; I don't know whether there is a steam-gauge to the engine-room; I merely gave the design, and did not at all go into detail.

Coroner.—You say you made the design for the engines and boilers; now, was it not essential that there should be proper valves and cocks for the safety of the vessel?

Witness.—Yes, there should; but the gentlemen for whom I made the design were engineers themselves, and it would have been presumption for me to have dictated to them what they were to do in detail.

By Captain Rowland.—I was told that the Victoria was not loaded over 10 pounds per inch; I did not see it myself; if the safety-valve were enclosed, it would certainly prevent any mischievous person from playing tricks or endangering the lives of the passengers by creating an over-pressure of steam.

By the Coroner.—I am not aware that there are any inaccessible safety-valves. I never heard the difference between high and low pressure defined; my notion always was, that they were either condensing boilers, or not so; it is altogether nonsense to talk about high and low pressure boilers.

Captain Bell recalled. - Before we left Blackwall I saw the pumps put on myself by the sailors, and saw the water pumped into the boilers. The witness then identified the bodies of the five unfortunate men.

Coroner. Can you tell who had the constructing of the engines and boilers?—Captain Bell. A poor unfortunate man named Swift was our chief engineer, and they were made under his superintendence. Swift is since dead; he expired, after two days' illness, of inflammation of the bowels.

Mr. John Penn, jun, examined. I am an engineer, and in pursuance of an order which I received, I have inspected those boilers to ascertain the cause of the accident that has occurred; I consider that the shortness of water in the boiler had the effect of over-heating the plates, and crusting them, thereby allowing the scalding water and steam to escape; I never before saw boilers constructed like them; they are cylindrical boilers with cylindrical flues or water-boxes, or whatever you may call them, in the centre; the water might have boiled over, and by that means have got drawn into the flues, but how low I do not know; the fires in the Victoria are certainly larger for the quantity of water than I have seen in other vessels. I conceive, if there was a good draught, such large fires might be made as to drive the water out of the boilers. The plates of the boilers were much thinner than we see them in the Thames steamers. There are proper feed pumps to the boilers The boilers don't carry so much water as steamers usually do. The water would, therefore, be sooner evaporated than in common ordinary boilers A foot of water in these boilers would be evaporated one-half sooner than in common ones.

Coroner.—Then to what do you attribute the cause of the accident, neglect of the engineers, or the bad construction of the boilers? Mr. Penn.—There must have been neglect, I have not a doubt.

By Mr. Jacobs. - If I were to make boilers for such a vessel as the Victoria, I should allow for 80 inches depth of water. Perhaps, from the top of the flues to the first gauge cock, the boilers might contain ten tons of water. I will not undertake to say that they will not contain eleven tons. I do not think that circular boilers are so strong as the common square boilers. If the engines had been worked at the general pressure of the Thames steamers, of from four to five pounds to the square inch with a square boiler, the accident would not have taken place. I doubt whether water can be kept in these boilers, from the narrow water spaces, and the intense heat of the fires. A skilful engineer would have raked out the fire, or slackened it when he found the water getting below a certain height; I should consider that boilers for such a ship as the Victoria should be 30 feet by 25 feet each, and that would require to be all horizontal surface. The cross examination of this witness was then continued at great length by Mr. Jacobs, who wished to show the proper construction of the boilers; but most of Mr. Penn's answers, that were favourable, were founded on hearsay, and it is impossible to give them in detail, as they alone would occupy two or three columns of our publication. The effect of his answers generally was, that the fires were more than equal to the supply of water in the boilers. The witness, in answer to further questions by the coroner, said, that a circular boiler made of plates half an inch thick, with ten pounds pressure to the inch, would, as he thought, not be safe.

Mr. Jacobs called the following witnesses:—

Mr Andrew Murray:—I am an engineer, and live at Blackwall; I consider that deficiency of water in the boilers was the cause of the accident; there is no difficulty in feeding these boilers; circular boilers are, in my opinion, considerably stronger than square boilers; if the water had boiled over into the cylinder, any fireman who had been on board a steamer before could discover it; these boilers are as strong as any boilers I have seen; up to the first gauge cock the boilers contain 356 cubic feet of water; it would take fifty minutes up the first, one hour and eighteen minutes up to the second, and two hours and four minutes up to the third gauge-cock to generate the water into steam.

Mr. Amherst Hawker Renton deposed. I am assistant to Messrs. Bramah and Robinson, of Pimlico; I consider the accident on board the Victoria arose from want of a proper supply of water; there is no difficulty in feeding the boilers with water.

James Massey, boiler-maker to Messrs Fairlie, of Millwall, gave similar testimony to the foregoing. The boilers were good ones, but perhaps required a little more attention than others.

There being no further evidence, the Coroner proceeded to sum up the whole.

The jury, after consulting for about half an hour, returned into court, and the foreman, addressing the Coroner, said:—It is the unanimous opinion of the jury that the deceased persons came by their deaths in consequence of the bursting of a boiler on board the Victoria steam-ship, of Hull; and the jury wish me to express the high satisfaction they feel at the conduct of Captain Bell, as also of the owners, for the manner in which they have brought up witnesses, and the pains they have taken to fully elicit the truth.

Mr. Jacobs returned thanks on the part of the Company, and said the engineer, Mr. Napier, who had designed the engines and boilers, was a gentleman of great skill and experience.

The proceedings then terminated.

PARLIAMENTARY PROCEEDINGS.

Feb. 26.—*Necropolis Cemetery Bill.*—Read second time.

Tenby Improvement and Harbour Bill.—Read second time.

Great Central Irish Railway.—Petition presented, and referred to Committee on Petitions.

Anti Dry-Rot Company Bill.—"For regulating the sums to be taken for licenses by the Anti Dry-Rot Company, and for vesting the profits thereof in the Company for a limited time," presented, and read first time; to be read second time.

Eastern Counties Railway Bill.—"To amend and enlarge the powers and provisions of the Act relating to the Eastern Counties Railway," presented, and read first time; to be read second time.

Gravesend Pier Bill.—Bill read second time.

Feb. 27.—*Cheltenham and Great Western Union Railway Bill.*—Read second time.

Grand Junction Railway.—Petition reported, and referred to Committee on Standing Orders.

Gravesend Cemetery.—Petition for Bill reported.

Feb. 28.—*Bolton and Preston Railway.*—Petition reported, and referred to Committee on Standing Orders.

March 1.—*Oxford and Great Western Union Railway.*—Petition reported.

Severn Navigation (Nos. 1 and 2).—Petitions for Bills reported.

Midland Counties (Mountsorrel) Railway. Report (27th February) from Select Committee on Standing Orders, read; Bill ordered to be brought in.

Edinburgh and Glasgow Railway.—Report (19th February) from Select Committee on Standing Orders read; Bill ordered to be brought in.

March 2.—*Edinburgh and Glasgow Railway Bill.*—"For making a Railway from Edinburgh to Glasgow, to be called 'The Edinburgh and Glasgow Railway,' with a branch to Falkirk," presented, and read first time; to be read second time.

March 7.—*London and Croydon Railway Bill.*—Read second time.

Isle of Thanet Cemetery.—Petition for Bill reported.

London Grand Junction Railway.—Petition reported, and referred to Committee on Standing Orders.

Bolton and Preston Railway.—Bill ordered to be brought in.

Grand Junction Railway.—Bill ordered to be brought in.

Oxford and Great Western Union Railway Bill.—"For making a Railway from Oxford to join the Great Western Railway near Didcot, with a branch therefrom to Abingdon, to be called 'The Oxford and Great Western Union Railway,'" presented, and read first time; to be read second time.

March 8.—*Manchester, Bolton, and Bury Canal and Railway Bill.*—Read second time, and committed.

Taff Vale Railway.—Petition for Bill reported, and Bill ordered.

Bristol and Exeter Railway.—Petition reported, and referred to Committee on Standing Orders.

Portsmouth Floating Bridge Bill.—"For establishing a Floating Bridge over the Harbour of Portsmouth, from Gosport Beach to Portsmouth Point, with proper approaches thereto," presented, and read first time: to be read second time.

Cookham Bridge Bill.—"For building a Bridge over the River Thames, from Cookham, in the county of Berks, to the opposite shore, in the parish of Woburn, in the county of Bucks," presented, and read first time; to be read second time.

London and Greenwich Railway Bill.—Reported.

March 9.—*Farringdon (London) Street.*—Report (27th February) from Select Committee on Standing Orders read; Bill ordered to be brought in.

Ardrossan Railway.—Petition reported, and referred to Committee on Standing Orders.

March 12, 1838.—*Taw Vale Railway and Dock Bill.*—"For making a Railway from Penhill, in the parish of Fremington, in the county of Devon, to the town of Barnstaple, and for constructing a Dock in the said parish of Fremington, to be called 'The Taw Vale Railway and Dock,'" presented, and read first time; to be read second time.

Garnkirk and Glasgow Railway.—Petition reported, and referred to Committee on Standing Orders.

March 13, 1838.—*Edinburgh and Glasgow Railway Bill.*—Read second time.

Sheffield Improvement Bill.—"For making a new street or thoroughfare, and widening and improving certain other streets or thoroughfares, within the town and borough of Sheffield, in the county of York," presented, and read first time.

Bury (Lancaster) Water-works.—Petition for Bill reported.

Oxford and Great Western Union Railway Bill.—Read second time.

Newtyle and Coupar Angus Railway. Report from Select Committee on Standing Orders read; Bill ordered.

Bolton and Preston Railway Bill.—"For enabling the Bolton and Preston Railway Company to extend and alter the Line of such Railway, and to make Collateral Branches thereto, and for amending and enlarging the powers and provisions of the Act relating thereto," presented, and read first time.

Cheltenham and Great Western Union Railway Bill.—Reported.

March 20.—*Brandling Junction Railway Bill.*—Read second time.

Bristol and Exeter Railway.—Reported, and Bill ordered to be brought in.

March 21.—*Gravesend Cemetery Bill.*—"For establishing a General Cemetery at Gravesend," read first time.

Isle of Thanet Cemetery.—Reported, and Bill ordered to be brought in.

London and Greenwich Railway Bill.—Read third time, and passed.

Church Building Materials.—Return ordered, "of the amount of all Drawbacks allowed on Building Materials used in the erection of Places of Public Worship in Great Britain, from 5th April, 1817, to 5th April, 1837, specifying the amount of allowance made for each edifice."

March 22.—*Deal Pier.*—Reported, and Bill ordered to be brought in.

Birmingham, Bristol, and Thames Junction Railway.—Reported, and Bill ordered to be brought in.

March 26.—*Southampton Pier Bill.*—To amend and enlarge the powers and provisions of an Act for making and maintaining a Pier and other works; read first time.

Severn Navigation (No. 1) *Bill.*—For improving the Navigation of the river Severn, from the Lock at the entrance of the Gloucester and Berkeley Canal to the Bridge over the river Severn, in the city of Worcester; read first time.

Farringdon Street Bill.—For making a new Street from Holborn Bridge, in the City of London, towards Clerkenwell Green; read first time.

London Grand Junction Railway Bill.—To amend and enlarge the powers and provisions of an Act relating to the said Railway; read first time.

Boughrood Bridge Bill.—For building a Bridge over the river Wye, at a place called Boughrood Ferry, in the counties of Brecon and Radnor, and for making convenient approaches thereto; read first time.

London and Croydon Railway (No. 1) *Bill.*—Reported.

Garnkirk and Glasgow Railway Bill.—For altering and amending several Acts relating to the said Railway; read first time.

Birmingham, Bristol, and Thames Junction Railway Bill.—To alter the line of the Birmingham, Bristol, and Thames Junction Railway, and to amend the Act relating thereto; read first time.

Isle of Thanet Cemetery Bill.—For establishing a Cemetery for the interment of the Dead by a Company to be called "The Isle of Thanet Cemetery Company;" read first time.

Taw Vale Railway and Dock Bill.—Read second time.

Deal Pier Bill.—For making and maintaining a Pier or Jetty, and other works; read first time.

Portsmouth Floating Bridge Bill.—Read second time.

Ladykirk and Norham (Tweed) Bridge Bill.—For building a Bridge over the river Tweed; read first time.

St. Philip's (Bristol) Bridge Bill.—For building a Bridge from the parish of Saint Philip and Jacob over the Floating Harbour to the parish of Temple, in the city and county of Bristol; read first time.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH FEBRUARY, AND THE 26TH MARCH, 1838.

Josiah Pearce Hollbrook, of Devonshire Place, Edgeware Road, Gentlemen, for "An Improved Method or Improved Methods of Propelling Vessels."—27th February; 6 months.

John Danforth Greenwood, and Richard Wynne Keene, of the Belvedere Road, Lambeth, Manufacturers, for an "Improvement in the Manufacture of Cement, and in the Application of Cements and other Earthy Substances to the purpose of producing Ornamental Surfaces."—27th February; 6 months.

Hippolyte François De Bouffet Montauban, Colonel of Cavalry, of Sloan Street, Chelsea, and John Carvalho De Medeiros, of Old London Street, Merchant, for "Certain Improvements in the Means of Producing Gas for Illumination, and in Apparatus connected with the Consumption thereof;" communicated by a Foreigner residing Abroad.—28th February; 6 months.

William Westley Richards, of Birmingham, Gunmaker, for an "Improved Primer for Fire arms."—2nd March; 6 months.

Charles Fletcher, of Stroud, in the County of Gloucester, Mechanist, for "Certain Improvements in the Construction of Looms for Weaving."—5th March; 6 months.

William Lewis, of Brunscomb, in the county of Gloucester, and John Ferrabee, of Thrupp Mill, in the same parish, for "Certain Improvements in Machinery for Dressing Woollen and other Cloths or Fabrics requiring such a process."—5th March; 2 months.

Henry Bessemer, of City Terrace, City Road, Engineer, for "Certain Improvements in Machinery or Apparatus for casting printing types, spaces, and quadrats, and the means of breaking off and counting the same."—8th March; 6 months.

William Hale, of Greenwich, Engineer, for "Improvements in Steam Engines, and Apparatus connected therewith, and in Machinery for propelling vessels."—8th March; 6 months.

Morton William Lawrence, of Leman Street, Goodman's Fields, Sugar Refiner, for "Certain Improvements in the process of Concentrating certain Vegetable Juices and Saccharine Solutions."—8th March; 4 months.

John Seaward, of the Canal Iron Works, Poplar, Engineer, for "An Improvement or Improvements in Steam Engines."—10th March; 6 months.

Charles Schroth, of Sablonier's Hotel, Leicester Square, Gentleman, for "Certain Improvements in Preparing, Pressing, and Embossing the surface of Leather. Communicated by a Foreigner residing abroad."—10th March; 6 months.

Thomas Evans, of the Dowlais Iron Works, Agent, for "An Improved Rail for railway purposes, together with the mode of manufacturing and fastening down the same."—10th March; 6 months.

Abraham Parker, of Gower Street, Bedford Square, Surveyor, and Oliver Byrne, of the same place, Professor of Mathematics, for "A new Instrument for Gauging Malt, and also for Gauging the fluid or solid contents of casks and other vessels."—10th March; 6 months.

William Dale, of Marsh Street, Stafford, Turner, for "Certain Improvements in constructing columns, pillars, bed-posts, and other such like articles"—14th March; 6 months.

Thomas Joyce, of Camberwell New-road, Gardener, for "Certain Improved Modes of, and Apparatus for, applying prepared fuel to various culinary and domestic purposes."—15th March; 6 months.

William Horsfield, of Swillington Mills, near Leeds, in the County of York, Corn Miller, for "Certain Improvements in the construction of Mills for grinding Corn."—19th March; 6 months.

Louis Joseph Amant Ramel, of Lisle Street, Leicester Square, Gentleman, for "Improvements in Machinery for excavating and embanking Earth, for the construction of Railways and other Works."—19th March; 6 months.

Robert Lucas Chance, of the Glass Works, Smethwick, Stafford, for "Improvements in the manufacture of Glass. Communicated by a Foreigner residing abroad" 19th March; 6 months.

Duchemin Victor, of Gracechurch Street, Gentleman, for "Improvements in Rotary Engines to be worked by steam or other aeriform fluids. Communicated by a Foreigner resident abroad."—19th March; 6 months.

James Hill, of Haley Bridge, Chester, Cotton Spinner, for "A Certain Apparatus applicable to Machinery, used in the preparation of Cotton, and other fibrous material, for the purpose of Spinning."—19th March; 6 months.

James Lowe, of King Street, Old Kent Road, in the county of Surrey, Mechanic, for "Improvements in propelling Vessels."—24th March; 6 months.

Michael Wheelwright Ivison, of Hailes Street, Edinburgh, Silk Spinner, for "An Improved Method of preparing and spinning silk, wool, flax, and other fibrous substances, and for discharging the gum from Silks, raw and manufactured."—26th March; 6 months.

Julius Oliver, late of Castle Street, Falcon Square, but now of Queen Street, Golden Square, Gentleman, for "A Certain Improvement in the Filters employed in Sugar Refining."—26th March; 6 months.

Auguste Coulon, of Token House Yard, in the City of London, Merchants, for "Improvements applicable to Block Printing; communicated by a Foreigner residing abroad."—26th March; 6 months.

Thomas Oram, of No. 27, East Street, Red Lion Square, Gentleman, for "Improvements in the manufacture of Fuel."—26th March; 6 months.

Charles Hullmandel, of Great Marlborough Street, Westminster, Lithographic Printer, for "A new Mode of preparing certain surfaces for being corroded with acids, in order to produce patterns and designs for the purpose of certain kinds of Printing and Transparencies."—26th March; 6 months.

Charles William Grant, a Captain of the Corps of Bombay Engineers, residing at No. 1, Saint Alban's Place, Westminster, for "Certain improved Methods of Exhibiting Signals for the purpose of communicating intelligence either at sea or on shore."—26th March; 6 months.

FOREIGN INTELLIGENCE.

Number of Buildings erected in New York in the Year 1836 and 1837.—The City Inspector presented his annual report to the Corporation of the number of buildings erected in this city; from which it appears, that during the year 1837, there were erected 840 buildings of all descriptions, being 986 less than were erected in 1836, in which year there were 1826 houses of all sorts erected. The decreased number of dwelling-houses erected, is 242; stores, 686; workshops or manufactories, 35; and stables, 23. Making in all 986 less than the year preceding.

Railways in France.—The following are the lines about to be undertaken by the French Government, according to the measure lately proposed to the Chamber of Deputies:—1. From Paris to the northern frontier, beginning in the Rue Lafayete, Faubourg St. Denis, and passing through St. Denis, Pontoise, Beauvais, Amiene, Arras, Douai, Lille, and Roubaix. A branch will go from Douai to Valenciennes. 2 From Paris to Rouen, forming part of the line to Havre. This road will be the same as that just mentioned as far as Pontoise, where it will branch off, and pass by Gisors, Estrepagny, and Charleval, and will descend by the valley of Andella to Rouen. 3. From Paris to Orleans, forming part of the line to Bordeaux. It will commence at the Boulevard de l'Hopital, and will pass through Corbeil and Etampes. 4. From Marseilles to Avignon, forming part of the line from the former place to Lyons. It will pass by the Valley des Aigaldes, will be tunnelled through the hills that separate the basin of Marseilles from the port of Berre, and will pass along the canal of Arles, by that town, and afterwards by Tarascon to Avignon.

Railroad in Tuscany.—According to letters from Florence of the 4th inst., a committee had been occupied during some time with the establishment of a railroad between that city, Leghorn, and Pisa. The distance between Florence and Leghorn is fifty-four Italian miles. The discovery of a very rich coal mine in Tuscany had encouraged the Grand Duke to undertake the work. The coal necessary for the consumption of the country had heretofore been imported from France

American National Foundry.—A meeting has been called at Richmond, to adopt means to procure the establishment of the National Foundry, proposed by Congress in that city. The Baltimore papers claim the location for their city, as a place peculiarly fitted for such an establishment. New York is quite as good a place as either; our position on the seaboard makes the facilities of communication with every part of the Union greater than those of any other city. This is a consideration of importance in case of an emergency that would require the shipment of heavy ordnance.—*New York Express.*

It is rumoured, says the *Temps*, that a subscription, at the head of which the King has desired his name to be placed, is forming, for the erection of a monument opposite that of the Belgian Lion, on the plain of Waterloo, to the memory of the brave men of the French army who fell in that great battle. Marshal Gerard is named as one of the committee, and the King of the Belgians is said to have assented to the project.

America.—Utica and Syracuse Railroad.—The work on this road has been commenced. The whole is under contract, and is estimated to cost about 600,000 dollars. The route is said to be a very favourable one—requiring but little excavation and grading. The road will probably be completed in the summer of next year—which will be an extension of sixty miles of railroad communication towards Buffalo.—*New York Daily Express.*

Destruction of the Bowery Theatre.—A little after 2 o'clock on Sunday morning, the 18th ult., the beautiful edifice, erected but little more than a year since, known as the Bowery Theatre, New York, was entirely destroyed by fire. The scenery, machinery and stage property being all highly combustible, were soon consumed, and at about 3 o'clock the roof fell in, sending aloft a mass of cinders which flew far and wide, and burying beneath it all that remained of the ill-starred Bowery Theatre. The wardrobe, scenery, and other properties, were valued at about 60,000 dollars, upon which there was no insurance. Insurance to the amount of 35,000 dollars had been effected upon the building, which, it is supposed, will not cover one-half of the whole actual loss. This is the third building, devoted to theatrical purposes and erected upon this spot, that has been burned within ten years. The first edifice was burned in May, 1828, the second in September, 1836, and the third on February 18, 1838.

MISCELLANEA.

Height of Waves.—Mr. Pentland writes from Valparaiso, that during the most violent storms which the frigate *Stag* encountered in the Pacific Ocean, the waves never rose more than twenty feet above the level of the sea. The greatest height the waves attained above the deck of the frigate, which had been observed and measured, did not exceed eighteen feet.

New Alloy of Zinc and Copper.—A committee of the French Academy of Sciences is engaged in investigating a new alloy of zinc and copper, which is said to possess qualities which fit it for extensive use in the arts and manufactures. Its cost will be little more than that of zinc. The pure metal of zinc oxydizes with great facility, which renders it unfit for a multitude of uses; the alloy, however, is oxydized with great difficulty. It will resist, for example, sulphuric acid of twenty degrees of concentration. Hence it may be used for mineral waters, for pipes and tubes through which acid liquids flow, and, in navigation, for the sheathing of vessels. The composition of the alloy depends on the uses to which it is applied. If it is applied in circumstances where zinc is commonly used, the inventor mixes with a great proportion of the latter metal a small quantity of tin and lead—an addition which does not augment the cost of the alloy more than a farthing a pound. The alloy which is used for boilers, gutters of houses, &c., contains no lead; but still, like the other, resists the sulphuric acid of twenty degrees concentration.—*Monthly Chronicle.*

Stoppage of the Canals.—The loss to the farming and mercantile interest of this part of the country, caused by the stoppage of the canals, can scarcely be estimated, and affords one of the strongest motives that can be adduced for extending the railway system into the rural districts. Whilst Lincolnshire has been losing its thousands, Ireland and the country connected with the railways of Liverpool and Manchester have enjoyed all the facilities of reaching the markets by means of the railways, and both flour and wheat have been abundantly supplied at remunerating prices: whilst there has been a general stagnation on the eastern side of the island. If this does not impel the landed interest to co-operate in the formation of railways, they must expect declining markets in those parts that are without the advantages that other parts have secured, and the current of trade and consumption to flow from remote districts even into the markets which heretofore have been considered specially to depend on Lincolnshire.—*Hull Observer.*

Crystallization.—M. Gaudin, who has been *making* minerals, has submitted to the Academy of Sciences more stalactites of carbonate of lime, which have been produced in a month: he has also succeeded in making microscopic glasses of melted rock crystal, which answer perfectly well, and magnify 250 times.

Electro Magnetism.—Mr. Cook made an interesting exhibition of an electro-magnetic machine, acting on the principle of Davenport's patent, now exhibiting in Barclay Street. The whole apparatus is of the most simple construction, consisting of two sets of magnets, one revolving within the other. The external magnets being excited by the fluid generated by the action of an ordinary galvanic battery, while the polarity of each magnet constantly and regularly changing, a perfectly uniform motion is communicated to the cylinder, which may be increased indefinitely as additional force is applied. The machine is thirty inches in diameter, and contains seventy-eight magnets, each weighing four pounds. The machine, in full operation, made eighty revolutions per minute—considerably more than can be obtained by the force of one man. Mr. Cook states that the power of the machine may be greatly increased by adding to the number of magnets, without enlarging the battery, and he intends to do so immediately, and apply the power, by way of experiment, to the working of a printing press. There are, of course, many imperfections in this machine, which is not yet complete, but they are obviously the result of mechanical arrangement, rather than of defect in the principle. The inventor of the mode of applying this newly-discovered power is quite sanguine of its complete success, and of ultimately superseding the use of steam in locomotion and propelling machinery. Another machine, to be worked by eight pairs of large magnets, of 100 pounds each, made by Mr. Davenport, was also shown, with three pairs of the magnets in motion, which performed well.—*New York Paper.*

Reciprocal Liberality.—By a recent arrangement, all English architects travelling for improvement in Saxony and the territory of the Hanse Towns, are to be admitted freely to view all the public buildings, &c., without expense—on the condition which has been acceded to by our own Government, that the architects of those countries shall enjoy a similar privilege here. Negotiations are in progress for the extension of this give-and-take system to other parts of the continent.—*Mech. Mag.*

Pompey's Pillar.—On the sixth of September last it blew a heavy gale at Alexandria from the westward, which raised such dense clouds of sand as to render distant objects totally invisible. But in the interval between the squalls, to the surprise of the officers of the Egyptian squadron and the inhabitants of the town, the colours of England were observed floating on the summit of Pompey's pillar, while a discharge of musketry was heard from the same elevated situation. On inquiry, it appeared that a party of officers belonging to her Britannic Majesty's steam-vessel Hermes, had, by means of a huge kite, contrived to get a piece of twine across the top of the pillar, to which was attached a small cord, and ultimately a larger one was hauled up, and a ladder was expeditiously formed. A party of ten then ascended the pillar and seated themselves on the summit, with the Union Jack planted in the centre. Here they drank to the health of Her Majesty Queen Victoria of England, with three times three, and fired a royal salute. The prospect of the surrounding sea and country from this elevation is described by one of the officers, who was of this intrepid party, as very fine; but the tremulous motion of the pillar was so great as to shake out the contents of a wine glass!—*Malta Gazette.*

New Day and Night Telegraph.—A telegraph of this nature is engaging the attention of the maritime interest. It is intended to answer the purposes of signalizing between the shore and ships in the offing, and to prevent steam-vessels coming into collision. It is also applicable to railways, and may be made available for coast-guard stations, for the revenue cutters and boats belonging to the coast-guard, and for signalizing for government ships. The night signals are completed by means of four figures; and the properties of the telegraph are, that, in whatever position, it will show a full front with a brilliant light; and although more figures will be required for the day signals, it will yet show a full front to the object communicated with. It is worked on a plan independent of lines; it is of a very simple arrangement, and appears applicable to all the purposes for which it is intended. The inventor is Capt. Smith, R.N., the officer who first called the attention of government to the important subject of appointing emigrant agents to protect and assist emigrants, and see that they were sent out in sea-worthy vessels

NOTICES TO CORRESPONDENTS.

We have been compelled to postpone several communications until next month, when we will endeavour to bring up the arrears.

C. L. O. must excuse us for not inserting his communication for the present, we should like to hear from him on a more *practical* subject.

Architectus is informed, in answer to his communication, that we have so arranged the Advertisements that they shall not appear in the Work when bound up; such pages as are *not* figured are then to be cancelled. The first volume we propose to conclude with the next December number.

I. I. will find a Notice of the Society, which we hope will be satisfactory.

BRIDGE ACROSS THE RIVER TEES.

Fig. 1.—ELEVATION.

Span of Arch 150 feet. Rise or versed sine 16 feet.

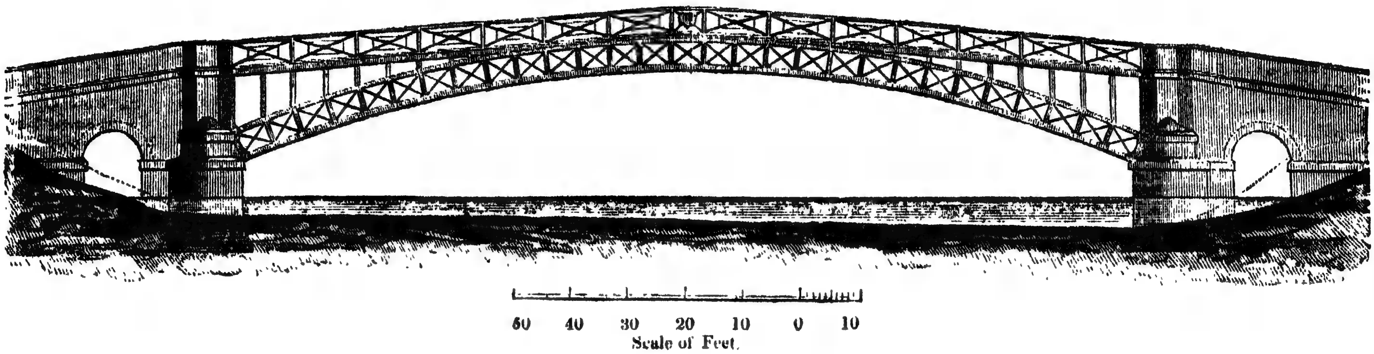


Fig. 2.—Section of Bridge and Elevation of Abutment Pier.

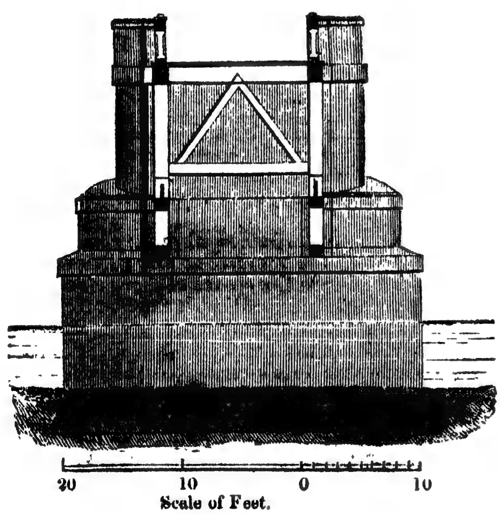


Fig. 3.—Section of Abutment and part of the Bridge.

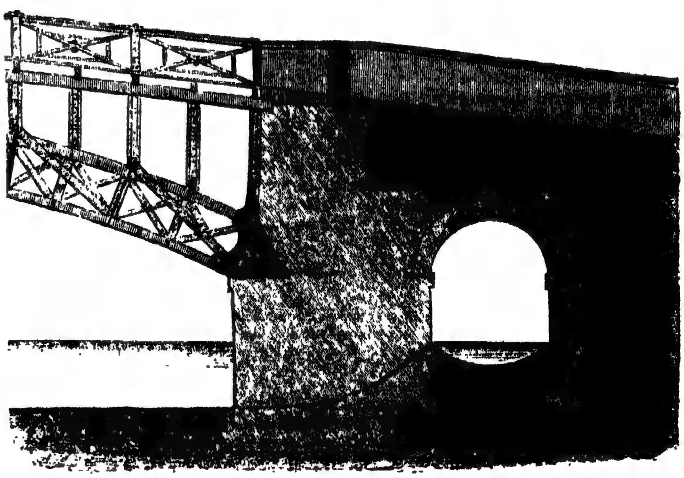


Fig. 4.—Plan of the Entrance to the Bridge and part of the Bridge.

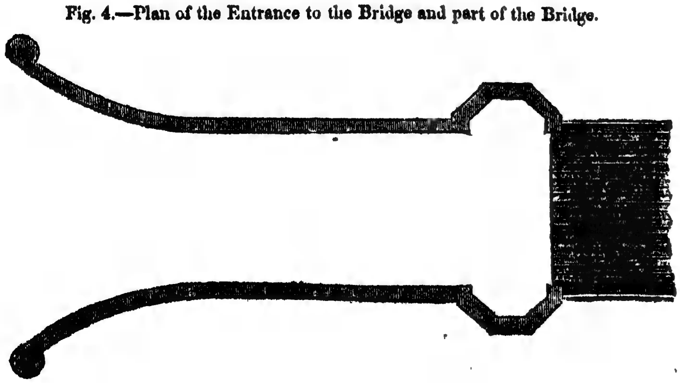
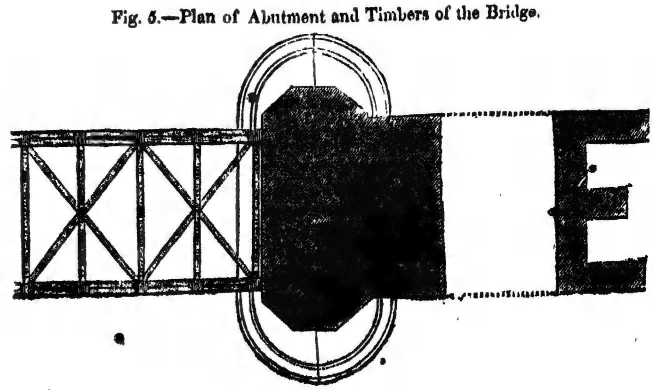


Fig. 5.—Plan of Abutment and Timbers of the Bridge.



BRIDGE ACROSS THE RIVER TEES, IN THE PARISH OF SOCKBURN, UNITING THE COUNTIES OF YORK AND DURHAM.

This bridge is now completed: and as it is a work of considerable importance, possessing features of interest and of novelty, we are happy to be enabled to give our readers a full description, accompanied with drawings. It has been built at the expense of Henry Collingwood Blackett, Esq., with the view of affording himself and his tenantry more easy access to the main road from York to Newcastle, distant about three miles, through the village of Smeaton: and also to the towns of Northallerton, Yarm, and Stockton-upon-Tees, and the different villages in the neighbourhood. The previous means of communication for horses and carriages was by a ford, passable only in dry weather. The course of the river having high ground on each side, a sudden and heavy rain has been known to swell the stream to the depth of fourteen feet in a few hours. The current being consequently very strong, the floods have been known to bear away trees of large dimensions torn up from their roots, where any wood plantation has reached the river banks. Hence the necessity of having a bridge the entire span of the river; as any intermediate support of piling for a superstructure would have been attended with some risk as to its stability, both from the floods above alluded to, and from the floating ice brought down the stream upon the breaking up of a frost. Piers of masonry, for any number of arches across the river, would in like manner have been objectionable, from the obstruction they would have caused in the channel, by contracting the water-way.

This bridge has been built from the designs and under the direction of Mr. William Hambley, of Park-street, Islington, London; and the execution of the works intrusted to Mr. Richard Golosbro, carpenter, of Harworth, near Darlington, to whose judicious care and management in the construction the highest praise is justly due. The structure has been opened for all the purposes intended, since December last; though the railing to the roadway was not completed till the 24th of March.

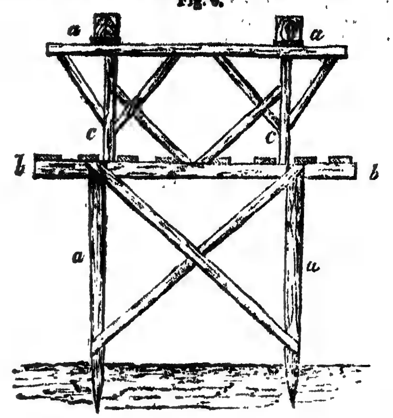
The main arch is composed of a series of framework in wood, forming an arch of 150 feet span, the versed sine or rise 16 feet; with a semicircular stone arch at each end, of 10 feet span; making together with the piers and wing walls, a length of 250 feet. The clear width in the roadway is thirteen feet.

The piers and arches at each end, with the abutments, are executed with stone quarried from the bed of the river, laid in equal courses, and tooled fair on the face. The material is a red sandstone, soft and free to work when first quarried, but which becomes hardened from exposure to the air. The larger masses have only a casing of masonry, the internal parts being filled in with a concrete composed of gravel (also from the bed of the river) and pounded stone lime, mixed in the proportions of six of gravel to one of lime. The casing of masonry was raised about two feet, and then a layer of concrete filled in to the same level; the masonry then proceeded another step, and received again a layer of concrete: the alternate heights were in different thicknesses, one being about one foot six inches, and the other two feet six inches, in order that a bond might be made with the stone and the concrete.

In the autumn of 1836, preparations were made and the work commenced, by laying the foundations of the stone piers. That on the Yorkshire side of the river was raised several feet above the bed, and a rough stage formed across the river to the level of the springing of the main arch. This stage was composed of larch wood piles, or other coarse timber of English growth, with bearers of fir, and the planking of the proposed roadway of the bridge laid upon them. It was intended as a means of fixing the timbers of the arched ribs across the river, and served for some time the purpose of a temporary bridge. In consequence of the severity of the winter, and the great floods, the works were suspended. The frost breaking up in February, 1837, the ice floating down the river carried away a portion of the stage; in fact, several of the piles were nearly cut asunder by the ice. This unfortunately gave rise to a report that the bridge had been carried away; whereas not a single piece of timber of the intended structure had been prepared for the purpose.

In the following May the works were resumed, and proceeded through the last summer and winter. By the end of June the masonry at each end was ready to receive the cast-iron seating plates of the wood arch, and the stone arches turned. In the meantime the curvature of the ribs had been set out upon a platform, and the carpenters proceeded with the framework. This being ready by the month of August, preparations were made for laying the seating plates within the masonry, and fixing the arched ribs from pier to pier. This was accomplished from the stage before alluded to, the injured parts having been restored. It was executed as shown by the sketch—a a,

Fig. 6.



larch, or other wood piles, driven about fifteen feet apart in the length and width of the bridge; *b*, fir bearer, upon which the proposed planking was laid; from this stage were raised the standards *c c*, to such heights as the curvature of the ribs required. As they proceeded from the springing of the arch towards the centre, these were braced, and three-inch planks laid flat on the top of the standards. On these the wood ribs *d d* were laid, with a sufficient space for two wedges over each support upon the planks. This stage and the carriage remained till the two ribs with the radiating timbers and diagonal braces were fixed. The wedges were then struck, and the weight of the ribs thrown upon their seatings and head joints, the latter having two thicknesses of lead, seven pounds to the foot. The stage with the carriage was then cleared away. The other part of the work was executed by forming a stage with plank upon the two upper ribs.

The circular ribs are formed in two thicknesses of timber, each twelve inches by six inches, and bolted together with seven-eighths round bolts; the heading joints are broken about every ten feet in length. Upon the ribs are raised the vertical timbers, which are ten inches by twelve inches; these are framed with the upper ribs, and passed through the longitudinal roadway beams (which are also in two thicknesses, twelve inches by six inches, and bolted together), and halved and bolted to these and the transverse beams of the roadway. The parts of the vertical timbers above the roadway are reduced in size, and formed into a series of trusses with the braces throughout the length of the bridge, and secured by stirrup-irons, bolts, and wedges, to the main ribs. Stretching beams or braces are framed across to each of the ribs, and secured by end grain bolts to the ribs. Upon these are placed diagonal braces to the centre of the transverse beams of the roadway; and with the latter are framed the diagonal and horizontal braces of the roadway, upon which the planks are laid with a slight coating of gravel.

In the construction of the framework, a very important consideration suggested itself, as to the removal of any part of the timbers which might become defective in the course of time. This has been kept in view, so that any single piece of timber may be removed without having recourse to shoring, or any other temporary means of support.

The durability of the work was also a subject to be carefully kept in view: with reference to which object, the bridge was constructed with the very best Memel timber Kyanized; the joints coated with tar, and the whole well painted.

The quantity of timber in the framework and roadway is about 4,250 cubic feet; and the expense of the whole bridge about £1,200.

REVIEWS.

Practical Essay on Steam Engine Boilers. By R. Armstrong, Civil Engineer. Manchester.

The third and concluding Part of this really practical and useful work is before us. Chapter IV. is occupied, in the first place, with a dissertation upon the action of sand, &c., within a boiler, which is treated in a very pretty manner. The only difficulty we have in comprehending the advantages so earnestly dwelt upon in *this chapter, in favour* of Mr. Scott's collectors, or generators, is the very decidedly *unfavourable* opinion given by the author, of the same system in Part 2, in which he stated that the pots, or collectors, although found useful in one sense, were generally abandoned in consequence of the difficulty of cleaning the boiler in which they were placed, in the usual manner, viz., by hand.

The author's improvement upon Mr. Scott's apparatus is thus dwelt upon:—

Now the circumstances under which a steam-engine boiler is placed, necessarily include a great variation in the state of ebullition of the water, it being most violent when the demand for steam is the greatest, and at such times we may conclude, that the superabundant carbonic acid, as well as the atmospheric air, and all other gases that admit of expulsion by boiling, are present

to a much smaller amount than at any other time,—of course the carbonate of lime is then deposited, and obeys the same laws as any insoluble deposit; consequently it accumulates in the sediment vessel or collector, precisely for the same reason as does the argillaceous and other sedimentary matter, as already explained. In fact, the carbonate of lime, although called a *chemical* deposit, is, at the time of its deposition, as much a *mechanical* one, as that of any insoluble matter, and it becomes so the instant it separates from the water in a solid state; but being an impalpable powder, it requires a collecting vessel more perfectly free from agitation, than the coarser mechanical deposits. The principal difficulty is to retain it in the sediment vessel; this object, however, is very well attained by an apparatus which I contrived and brought into use in 1829; it was made by forming the upper part of the collectors of a hopper shape, to which was attached a lower part or receiver, made perfectly water-tight;—from this receiver a pipe was carried to the outside of the boiler, through which, by means of a valve, the contents of the receiver were discharged as often as necessary.

The object of the above contrivance, was to combine the principles of Maudsley and Field's patent of 1824, with that of Mr. Scott's of 1827, with the intention of making it useful for marine or steam-packet boilers. Now the proper use of this discharging apparatus is essential to the complete attainment of the object of keeping the boiler perfectly free from *incrustations of carbonate of lime*; for if this deposit is allowed to remain in the receiver too long, it is liable to be in part re-dissolved by any increase in the quantity of *free carbonic acid*, only to be again re-deposited; but which, of course, may be prevented by *blowing it out frequently* along with the rest of the sediment.

That this apparatus is not yet fully adopted in steam packets, arises from the same causes which so long delayed its general use in factories. In the few trials which it has already had in the City of Dublin Company's packet the "Shamrock," its perfect efficacy has been proved—so far as can be expected of any new invention, when there has not been sufficient experience to perfect all its details. The apparatus was proved to collect the thick brine as it became concentrated by the evaporation of the sea water, and while being blown out, it partly crystallized, or assumed the state of a fine salt, with just as much water as was sufficient to hold it in a semifluid state, and which was essential to its discharge. The discharge is effected by the pressure of the steam acting suddenly upon the contents of the receiver, and blowing them through a pipe fixed in the side of the vessel. Through this pipe large substances can be sent with great force, after the manner of a steam-gun.

* * * * * *

A modification of Mr. Scott's patent collectors, somewhat similar to those already described, with the addition of an agitator, which is worked by a small shaft or spindle passing through a stuffing box to the outside of the boiler, answers the above purpose very effectually, as it admits of the use of potatoes, or any other treatment to which the boiler may be subjected for the sulphate of lime, without the liability of the apparatus becoming clogged up.

The openings into the collecting vessels of this apparatus, or self-cleansing machine, are made sufficiently small to enable it to catch *nearly all the carbonate of lime*, while it also catches the *whole* of the other sediment; which is discharged from time to time, without any interruption to the working of either the boiler or engine.

The above apparatus, in its present improved state, is called a *machine*, although it is not exactly a machine in the ordinary acceptation of the word, on account of the extreme simplicity of its construction, there being neither wheel nor pinion about it, nor indeed any of the other mechanical powers, unless the lever of the handle may be so called, which puts the discharging apparatus in action. Moreover, unlike all other machines, its most important functions are performed while standing still. It is never put into action but two or three times in the course of a day, for discharging or "blowing out," and that for less than half a minute each time, according to the quantity of sediment which it has collected; consequently, it is not very liable to wear out, besides rendering its first cost comparatively small.

The author of this work, by an arrangement with the patentee, made and fixed up several hundred of these boiler cleansing machines in this district, the boilers to which they are attached not having required any other mode of cleaning out for some years. There are one hundred and seventy of these machines now in use in Manchester alone, so that any considerations in the construction of a boiler, with a view to the necessity of a man going inside to clean it out, may be safely discarded.

The evidence contained in the last paragraph alone is valuable, and it can scarcely need our recommendation that proprietors of steam boilers would do well to avail themselves of this contrivance; in fact, if it prove so highly effective as here stated, it would be very easy to apply it to a locomotive, by placing the collectors before and behind the fire-box, and connecting them by pipes, so as to blow out the whole at one operation.

The following extract expresses the author's opinion of the cause of explosions:—

Most people are aware of the rage for building very large factory chimneys, during the last few years, and as they are usually built much larger at first than the wants of the factory require, there is always a surplus draught, which, by setting the main damper wide open, can be taken advantage of to any extent, and in many cases to cause an intensity of heat almost equal to that in a blast furnace. Where this surplus draught is easily available, the fireman has little to do but open his dampers, and the steam is got up in one half the time that it required formerly.

Whether the boiler is dirty, or has too much water in it, one consequence is the same, under ordinary circumstances, namely, a greater length of time is required for getting up the steam, and this necessarily requires the earlier attendance of the fireman. Now the fireman is not generally summoned at a certain hour like the regular mill hands, and if he can only contrive to get up the steam in sufficient time for the engine starting at the appointed minute, there is seldom any fault found; therefore any expedient which will enable him to prolong the period of his commencing work is not likely to be neglected, and such an expedient he has wherever there is a good draught.

It unfortunately happens that, in this matter, the interests of the manufacturer and those of humanity do not agree; for it has been incontestably proved, that a strong draught is extremely favourable for saving fuel, as may be judged from the fact, that the time for getting up the steam has been in some instances reduced from upwards of an hour to twenty or twenty-five minutes, and although the saving of coal has not been in anything like that proportion, yet it has been very considerable.

Under similar circumstances to those just mentioned, there can be no doubt that a portion of the boiler bottom occasionally becomes nearly red hot, although this condition appears extremely inconsistent with the supposition that it is at the same time covered with water; yet I have been compelled to adopt this conclusion, from having had ocular demonstration of its possibility, as well as other reasons. I had frequently heard the fact stated by intelligent enginemen, and had more than once been called to witness it, although even then inclined to consider it a mistake, owing to the difficulty of ascertaining it clearly; for a slight approach to the incandescent state must be nearly invisible, owing to the strong glare of light from the furnace directly beneath, while any degree of heat much higher would be sure to weaken the iron so much as to cause the boiler bottom to give way.

In one instance, however, the rivet heads appeared to be approaching to a dull red, and I immediately took care to satisfy myself that sufficient water was in the boiler. On returning to the furnace, my doubts were at once removed, on seeing a circular space, of six or eight inches in diameter, in one of the plates over the middle of the fire "drawn down" into a spherical segment, or swelling, of about two inches in depth, something similar in appearance to those formed on a smaller scale in glass-blowing; but its further protrusion had evidently been checked by the sudden opening of the fire-door, which, no doubt, prevented any serious consequence at the time. The boiler was a cylinder, of nearly six feet in diameter, and the pressure was about nine or ten pounds to the square inch. The occurrence took place just at the moment of the steam being sufficient to blow away at the safety valve, and a few minutes before the engine started. For a few days afterwards, *this segmental protuberance was observed to increase* gradually to a hemispherical shape, of three or four inches in depth, when it *burst without doing any further damage than putting out the fire.*

The probability of boiler bottoms sometimes approaching a red heat, receives a *corroborative proof on examination of the iron plates*, in many cases, where the boilers have bulged out in the manner we have been describing, and which exhibit an appearance, well known to boiler-makers by a peculiar colour in the iron surrounding the part which has been red hot.

Whenever a boiler bottom is seen in this state, of course the only method of avoiding danger is to slack the fire immediately, by opening the fire-doors. But it frequently happens that the fireman fancies the boiler to be empty, and, if he have an opportunity, he immediately lets into it a quantity of water, when the consequence uniformly is, that the boiler bursts instantly.

From the premises we have laid down, it may fairly be concluded, that the pressure of the steam, suddenly generated at the moment of explosion, will bear some near proportion to the area of the hole or aperture; and as the actual pressure exerted the instant after the aperture is formed must be equal to the previous pressure drawn into, or multiplied by, that area, we may assume the square of the area, or fourth power of the diameter of the aperture, as representing a good approximation to the proportional force exerted—the reaction of this force propelling the boiler in a direction opposite to the aperture.

Hence, we have a reason why the bursting of a comparatively small hole in a boiler bottom produces such a very feeble effect, as compared to one of six or eight times its diameter. For if the force of explosion in any given case be called 1, then the force in any other case, producing an aperture of double the diameter of the former (other circumstances being the same), will be represented by $2^4=16$; if of

3 times the diameter, it will be		$3^4=81$
4 times	"	$4^4=256$
6 times	"	$6^4=1296$
8 times	"	$8^4=4096$

Some persons who have paid a good deal of attention to the circumstances connected with explosions, have doubted the possibility of steam being generated in sufficient quantity so suddenly as my explanation would seem to require: this, of course, is a matter which can only be proved by direct experiment, and such an experiment is yet a desideratum in this country. At present we have only one of the American experiments which throws any light upon this part of the subject; the repeating of this experiment on a large scale is highly desirable, although it would be attended with some danger and not a little expense. In the one alluded to, water was purposely injected into the boiler when the bottom was *red-hot*, by which means the steam was raised from one up to *twelve* atmospheres (180 pounds per square inch) *in one minute*, when the boiler exploded with violence. The American report states, that in the violence of the effect, the experiment was not carried so far as it might have been, from not throwing in a sufficient quantity of

water; consequently, the metal was not *cooled down to the "point of maximum vaporisation"* when the explosion took place, otherwise the pressure, as indicated by the thermometer the moment before the explosion, might have reached about forty atmospheres in the same time.

The above-mentioned experiment supplies an illustration of the general inutility of safety valves in case of sudden explosion. The safety valve is, in fact, a perfectly useless appendage to a low pressure boiler provided with the ordinary feed pipe in common use in factories; more especially when the buoy rod is made to pass through an open pipe of the same height as the feed cistern, instead of working through a stuffing box. This well-known feeding apparatus is an infallible preventive against the steam getting *(gradually)* too high, as well as against the water getting too low; the latter being by far the most dangerous predicament of the two, and a frequent cause of explosion.

We have extracted thus largely, because we consider the view of the subject taken by the author deserving much consideration; and although we agree that in a *common boiler* the water getting too low is the proximate cause of the boiler attaining a dangerous temperature, it is the *large quantity* of water still in the boiler, when some part is heated above, or at, the point of maximum evaporation, which is the reason of the prodigious and sudden creation of steam causing the explosion. If a boiler of the ordinary construction, instead of being heated up to 220 degrees, with a considerable load of water covering the surfaces, were heated to 500 degrees, and the same surfaces wetted or suddenly covered with a *large quantity* of water, the generation of steam would be so prodigious that nothing could withstand it. Therefore, this being the case, an ordinary marine boiler is the most dangerous of all possible contrivances of the kind. The upper part of the flues are covered with water to the depth of only a few inches; should this quantity, from whatever cause, be evaporated, the fire would, in the course of a few seconds, heat the surfaces up to 500 degrees, and beyond it; this would (supposing the upper surfaces dry) overheat the steam, then the steam would become a generator, by communicating its heat to the water remaining in the boiler; and in proportion as the quantity of water decreased, the water would become agitated, thrown in foam upon the heated plates, and thus create a generation so rapid, as fully to account for any explosions which may result; and this was unquestionably the cause of the late catastrophe to the "Victoria" steamer, in the Thames.

We do not agree with the author that the feed head is the best safety valve. In any case its efficacy is limited, like that of the safety valve, to the size of the orifice; and it has this very great disadvantage, that before the steam can escape, all the water above the level of the bottom of the pipe, which is perhaps six inches from the bottom of the boiler, must be driven out. Its greatest recommendation is driving out the explosive matter or water; but we apprehend, that in the case of the boiler becoming overheated, as at present constructed, the feed head would allow the water to pass so slowly, as to be of very small service; and if the pipe were made larger, the heated and exposed column of water would be the objection.

We must also except against the expression "that the interests of the manufacturer and those of humanity do not agree," in respect of the construction of large chimneys in order to increase the draught. If the interests of the manufacturer are thus served by economy of fuel, both in quantity and quality, so are those of humanity by the consequent reduction of price in necessary and useful commodities. Again, if the interests of humanity require that this powerful machinery should not by neglect be blown up, to the destruction of human life; no less do those of the manufacturer, that it should not be carelessly destroyed at the expense of his capital. It is, in fact, the interests of the manufacturer, and the supposed interests of a lazy and unpunctual engine-man, that do not agree. And we think Mr. Armstrong will agree with us, that it is desirable rather to make the engine-man punctual, by stricter supervision, than to give up the advantage of the increased draught obtained by the large chimneys. Nothing is easier than to put up in the engine-house a silent witness, to record the time at which the engine-man arrived, and to call him to account for every minute that he was too late.

Chapter V. "General principles in the construction of boilers, and a description of the various kinds of boilers in general use in the manufacturing districts," is exceedingly interesting; but our extracts have been already so ample, that we must refer our readers to the work itself. In conclusion, we cannot but express the very high opinion we entertain in favour of the work, and have no doubt it will be found exceedingly useful, and will be very extensively read by the public.

Gothic Architecture—Penny Cyclopædia, Part 63.

THIS, and the other architectural articles hitherto published in the Penny Cyclopædia—viz. "Civil Architecture," "Design (Architectural)," "Egyptian Architecture," &c., although unavoidably limited in extent, are so far from being superficial compilations, that at the same time their subjects are treated as perspicuously and popularly as they admit, more information may be gained from them than from longer treatises of the same kind in other publications. In saying this, we do not express our own opinion alone, but that of many others; for we have heard it remarked of the article on "Civil Architecture," that it gives a far more distinct insight into the principles and character of the Grecian orders, than is to be obtained from almost any other account of them. To this may be added, that reference being made in it to the best specimens of the different orders in buildings about town, not only is the learner's memory greatly assisted, but an additional interest excited. The article on "Design," explaining the nature of plans, sections, and geometrical drawings, has the further advantage of being altogether novel; for before they had only been briefly defined under their respective terms, and that generally so unsatisfactorily as to be hardly intelligible, except to those who, least of all, needed any information relative to them; whereas, not only are their various purposes fully explained, but in such a way as forcibly to point out the very great interest connected with the accurate investigation of such drawings.

This last published article, on "Gothic architecture," is treated with equal ability, and does all that could be accomplished within the limits assigned to it, for it is evident that the writer has had to contend with the difficulty so imposed upon him. Notwithstanding this, it will be found to contain much original observation and remark; for instance, in regard to the term Perpendicular, applied by Rickman to the third style into which he subdivides Gothic, it is objected, that Horizontal would be equally, if not more, applicable to it, inasmuch as the numerous transoms to windows, square-headed labels to doorways, &c., produce as many horizontal lines, as the mullions to windows, and ornamental panellings do perpendicular ones.

It is difficult to select any extract by way of specimen, unless it be the conclusion, where the characteristics of Grecian and Gothic architecture are thus summed up:—"*Grecian:* columns and their entablature are the chief sources of decoration, and limit the height of the building, as a second order cannot, with propriety, be placed above another. *Gothic:* columns, subordinate members; never used, except to support arches; and, in the latter styles, are mere ornamental shafts attached to piers. *Grecian:* colonnades seldom employed, except externally. *Gothic:* ranges of open arches, applied only internally. There being nothing analogous to a Grecian portico, some porches have merely an open arch in front, and when projecting from the building, are closed at the sides. Externally, open arches are introduced only in upper galvins, and those are of very rare occurrence; or as a cloister, not projecting from, but within, the lower part of the building. *Grecian:* lofty proportions unattainable, even in the largest edifices, because the greater the number of columns, the lower will they appear in comparison with their length or breadth. *Gothic:* no restraint as to loftiness, that not being regulated by width, either of the whole front, or any of its parts. *Grecian:* the pitch of a pediment must be governed by its span, since its height must in no case greatly exceed the depth of the entablature; consequently, the greater the number of the columns placed beneath it, the lower it must be, and the lower the proportions of the whole front. *Gothic:* gables may be made of any pitch, just as best accords with construction or composition of the design." Various other distinctive peculiarities of the respective styles are thus contrasted together, in such manner as to prove highly instructive, by calling attention to them, and impressing them on the mind of the reader.

PROFESSOR PUGIN'S FIRST LECTURE.

WELBY PUGIN has just made his debut in a new character, viz., that of Professor of Ecclesiastical Antiquities, at St. Mary's College, Oscott; and, as it was to be expected, his first appearance upon that stage has turned out a marvellous one. Marvellous at least was his lecture, which has been printed pro bono publico in the Catholic Magazine for April. It was both frothy and foaming—frothy in argument, foaming with bile and vituperation against the Protestant Church, and against all his brother architects of the present day, whom he denounces *en masse*—perhaps when he should have been at mass—as a set of tasteless, mercenary *miserables*, insolent, ignorant pretenders, and downright charlatans.

It is greatly to be feared, that the learned Professor is in a most violent bilious fever, for his bile conjures up images to his imagination that again excite his bile till it boils quite over, sending forth a most awful hissing. For instance, it moves him quite into a fit of madness on one occasion, during which he beholds a vision of "spruce parsons" attended by liveried minions, and whose tables actually "groan under the weight of delicacies to pamper their palled appe-

tites." According, therefore, to him, the English Church is suffering from plethora, and its "parsons" are likely to die of surfeits, unless made to disgorge their good things into the bosom of Rome. A few Romish fasts would, no doubt, be of very great service both to them and their "liveried minions," who might be delivered over to the dominions of either Cerberus, or the Cerberus-crowned Majesty of Rome.

That the Professor himself is a stanch advocate for fasts we can readily believe, seeing how very fast indeed his tongue runs on, when, fancying himself no less than an architectural Pope, he fulminates his bulls and bullying tirades against modern English architects. Ecce signum: "They have," exclaims our orthodox Professor, "a set of stale ideas, drawn from borrowed sources, which they keep as stock patterns, and transpose to serve all purposes. They do not understand any style, but profess themselves masters of all, and will undertake any absurdity to suit the taste of an individual, provided they are well paid." In merely a first lecture, this promises well for the future. Let us not, however, omit the following *beau ideal* of a modern English architect, as hit off by our smelfungus Professor:—"In fine, he draws, looks, thinks, and lives, at so much per cent." It would seem that Protestant architects are about as mercenary as Catholic priests, who would suffer Catholic souls to fry in purgatory until doomsday, unless paid for praying them out of it; whereas, if they themselves really believe there is any efficacy at all in their prayers, they ought to bestow them, whether paid for so doing or not.

As far as Catholicism or Protestantism are concerned in the matter, we believe that far more egregious architectural absurdities may be laid to the charge of the former than of the latter. Has Protestant England ever produced aught that can rival the extravagancies of Borromini, or the absurd freaks of Padre Guarini, who even out-Borromined Borromini himself? If there be that connexion between religious and architectural heterodoxy, which our bilious Professor more than insinuates—for it constitutes, in fact, the gist of his whole lecture—his Holiness would do well to blow up St. Peter's, and many other churches at Rome, were it merely to escape a blowing up from the orthodox Pugin. Without disparaging what is really good in Italian architecture, it may be affirmed, that there is hardly an absurdity conceivable that has not been perpetrated by the architects of Catholic Italy; and to Italy may be added most other Catholic countries. We must admit, that there is no want of ornament in their churches; yet very much of it is in the most peurile and gewgaw taste, hardly a degree superior to that displayed in a Bartholomew Fair booth.

However, we are now getting into "the Professor's own" vein—namely, the declamatory and vituperative, and will therefore desist from that strain, and give him a piece of sound advice; which is, that if he be really anxious for the interests of architecture, and not, as we strongly suspect, intent upon ingratiating himself with those he has gone over to, he would be more likely to promote better taste, were he to abandon wholesale indiscriminate reviling of the architects and buildings of the present age for temperate, or at least intelligible, criticism. If the Professor can do anything more than bark and howl at his architectural brethren, they will, no doubt, attend properly to advice properly given. But by persisting in the course he seems now bent upon, his rabid invectives will obtain for him nothing better than their universal dislike and derision; nor does any one feel it a reproach to be decried by him, since not the slightest merit is attributed to any of his neighbours. Undoubtedly, Welby Pugin has earned for himself some distinction, yet hardly is it of a very enviable kind, for he has made himself no better than a laughing-stock, and his name a by-word of reproach; with which remark we shall ourselves now say the word of good-by to the man of St. Marie's Grange, and the Professor of St. Mary's College.

SIR WALTER SCOTT'S MONUMENT.

Letter to his Grace the Duke of Hamilton, and the other Noblemen and Gentlemen, the Committee appointed by the Subscribers for a Monument in Edinburgh to the Memory of Sir Walter Scott. Edinburgh, 1838.

Mr. Cadell, one of the sub-committee, here enters his protest against anything in the Gothic style being adopted for the architectural part of the projected monument. This much we plainly understand, but can make out very little more; for although the letter may be intelligible enough to those to whom it is addressed, and who are, of course, acquainted with the whole of the proceedings referred to, we must confess it contains by no means so clear a statement of them as to enable those who, like ourselves, know no more of the matter than what they are told, to comprehend it very clearly. It would not have been amiss, therefore, since the writer determined upon publishing his letter, had he prefaced it by a plain narrative of the proceedings up to the time of its being written—viz., March 15.

What we can collect from the letter itself is, that Mr. Kemp's design, which obtained one of the fifty-guinea premiums, has at present many in its favour, while Mr. Cadell is decidedly averse to it. He speaks of it contemptuously enough, as emanating from one "unheard of as *professional*, and who can adduce no specimen of what he has done in architecture, not even the erection of a cowhouse!" This, it strikes us, is very illiberal prejudice, to say the least of it, and abets a system calculated to keep talent back, instead of encouraging it. If Mr. Kemp was never heard of before, it is so much the more to his credit that he should, all at once, have distinguished himself by producing a design that obtained one of the premiums, and that has been allowed by Mr. Burn, himself well known as an eminent Scottish architect, to have been "*the best he* had seen" of the proposed monuments. The question, we presume, is not whether Mr. Kemp has ever built a "cowhouse," but whether his design was worthy of being carried into execution; for, if not, it ought not to be so, although he had built not only all the "cowhouses," but all the houses in Edinburgh itself. Whether James Wyatt ever tried his hand at first building a stable we know not, yet the Pantheon, in Oxford Street, is generally considered to have been his architectural *debut*, although he was, till then, quite "unheard of as *professional*." Really we must say that we dissent *toto cœlo* from Mr. Cadell, in regard to the argument he there goes upon; for we hold it to be an exceedingly ungenerous one, and one, moreover, which almost betrays that he trusts more to the prejudice likely so to be excited against Mr. Kemp, than to any valid objections he (the writer of the letter) can bring forward against the design; since, if he could prove it to be unsatisfactory as a design, wherefore should he attempt to raise objections against it on any other grounds?

It seems, besides, to us, that the course of argument adopted by Mr. Cadell is altogether at variance with the system of competition, one main advantage of which is, that the names of the competitors being concealed, the judges are likely to decide impartially, if not always discreetly, and to award the prizes according to the degree of merit they discern, although by so doing they may stumble upon one "unheard of as professional." So far we speak our own sentiments quite impartially; for we do not pledge ourselves to promise that we should stand up strenuously for Mr. Kemp's design, had we the opportunity of examining it. At present we can only say, that Mr. Burn's testimony in its favour weighs quite as much with us as all that Mr. Cadell urges against it. Instead of fully describing it, which he might have done in a note, if not in the letter itself, all that he enables us to understand of the design is, that it is a Gothic spire, about 138 feet high, below which would be four open arches (i. e. one arch on each side), within which would be placed the statue of Sir Walter. He contends, that anything like a steeple or spire, which can be considered only as adjunct to a church, would be an absurdity. Yet, if an absurdity, it must be admitted to be less preposterous than the frequent one of a column, with a statue hoisted upon it; because a spire is at least an integral structure, although applied only in combination with other parts, whereas a column is a mere COMPONENT MEMBER of an edifice, never intended to stand by itself. A spire, like a tower, is complete, though nothing be added to it; but not so a column, because the latter requires the entablature it is intended to support. Therefore the spire is, of the two, infinitely the less objectionable; and there is, besides, precedent for such form in our ancient Gothic crosses, as in that removed from Bristol, and now standing in the grounds at Stourhead. It is very possible that the design in question may be too much of a mere spire, which form may not be well modified to suit the particular purpose. This is a point on which we can offer no opinion; it is enough for us to show that the ground of objection taken up by Mr. C. is somewhat frivolous and untenable.

Yet, if he shows himself to be rather short-sighted in overlooking the analogous, and far more censurable case of a Grecian column being employed as an independent architectural object, it must be allowed he manifests extreme foresight and long-sightedness when he says, that a spire will be likely to be misunderstood even in our day, and far more so when we are gone. Now, without misunderstanding Mr. Cadell, it is difficult for us to understand how the kind of inconvenience he contemplates can arise. Probably he means no more than it will not be understood by those who may happen to see it, without having ever heard that such a thing existed; that is, it will not be understood by those who fall suddenly down from the clouds. Equally groundless is the apprehension that it will at all events be a puzzle and mystery to those who come after us. Does the writer, then, contemplate the chance of some strange pause or chasm in the series linking one generation to another, during which everything connected with the monument will have been utterly forgotten?

more likely than ever to be quite forgotten, when records of them are diffused through the press in innumerable ways? If so, future antiquaries will be terribly posed; and some of them, perhaps, will write very learned dissertations to prove that Athens was situated north of the Tweed, in confirmation of which hypothesis they will confidently appeal to the remains of the Parthenon on the Calton Hill. Alas! for poor posterity, how egregiously will it be hoaxed and mystified, not only in that, but numerous other instances.

We have reserved for this last place Mr. Cadell's objections to the adoption of the Gothic style, for at first they looked so formidable, that we almost thought our more prudent course would be to *shirk* them altogether. Yet, on looking at them again, we took heart, discovering them to be in fact perfectly harmless. Besides, ridiculing the "*gingerbread taste*" of monastic Gothic ornaments—even so, the gingerbread taste!—he cites no other than Sir Walter Scott himself as a witness on his side, quoting two passages from his works, which certainly do appear at first sight to discountenance all imitation of that style. Yet it is at first sight only, for as soon as we give ourselves time to think, we perceive that the argument is not propped, but *Mrs. Malaproped* by the quotation of those passages, which go no further than to show that Sir Walter had a horror—and no wonder, of such Gothicizing as that exhibited "in a cupboard in the form of a cathedral, and a pig-house with a front borrowed from the façade of an ancient chapel." Does the ridicule he cast upon such absurdities warrant us in concluding that he disliked or undervalued this style itself? Quite the contrary; it was his admiration of it that led him to deprecate trumpery and paltry imitations of it for unworthy purposes. That he was not at all averse even to modern imitations of it, when appropriate and upon a suitable scale, we have sufficient proof in one of his works, namely, his own mansion at Abbotsford, although it did not exactly suit Mr. Cadell's purpose to quote that. But we conclude, for our review on his pamphlet is growing nearly as long as the pamphlet itself.

We subjoin in this place two letters on the subject of the Monument (the first by Mr. Hamilton, the architect), which have appeared in the "Edinburgh Courant."

57, York Place, March 27, 1838.

Dear Sir,—I have received your letter of yesterday. I am aware of, and sincerely regret, the want of unanimity which has arisen regarding the proposed Monument to Sir Walter Scott. I early anticipated that difficulties would arise, and have always thought that in such cases some tribunal, chiefly professional, perhaps, but so constituted as to carry great weight with the public, would be the fittest to give a satisfactory decision upon competing designs.

Though I should willingly avoid any share in these disputed matters, I feel a deep interest in them as a citizen of Edinburgh, and an admirer of our immortal countryman, and therefore submit the following answers to the queries you have put to me:—

1. Mr. Kemp's design has little resemblance to the spire of Antwerp Cathedral, which is of a very light and graceful outline. The arrangement of some parts of his detail, however, approaches to that of Antwerp.

2. The statement that Mr. Kemp's design resembled the spire designed by me for John Knox's Church, was made by you, I believe, entirely on your own authority. For myself I never saw Mr. Kemp's plan till the middle of last week, when I recognised an accordance between some features of his design and of mine, not only in so far as regards the spire itself, but also in reference to the four small towers or buttresses, abutting diagonally against Mr. Kemp's monument at its base, and which are not dissimilar to those at the west end of John Knox's Church. Unquestionably, however, many deviations occur, but instead of offering my own opinion on this subject, I beg to send you a drawing of the John Knox steeple, made about eight years ago, to the base of which my son has attached a sketch of the west end of the church itself, omitting of course the tracery of the great window, and slightly varying the position of the two lateral towers, so as to make the arrangement somewhat similar to that adopted by Mr. Kemp.

This will afford the groundwork for a comparison, but it will be necessary to keep in mind that my spire was to have been 250 feet high, and that any such design for a spire about half the height would be very defective.

In regard to Melrose Abbey, I observe that Mr. Kemp states that "the whole of the details in his design are strictly copied from Melrose Abbey." The ornaments of the parapets, and some other details, undoubtedly resemble those of Melrose; but while the general design is of a character altogether different, a proportion of the details is without any precedent in that building. As examples of this, I may refer you to the four towers at the base, and the forms of the flying buttresses. There are other instances, but it is needless to be more particular.

In giving these instances I do not mean to disparage Mr. Kemp's design on that account, as I agree with Mr. Roberts in thinking that if appropriateness is observed, there is no necessity for selecting the enrichments from an

To your [illegible]

1. Your first question involves a matter simply of opinion, I may therefore freely state that I should regret to see Mr. Kemp's design followed out. To my mind it is deficient in the monumental character, which is here the primary requisite. If it is not to be regarded as entirely anomalous, it will most probably be considered as a highly decorated Gothic steeple, the appropriate adjunct only of a church, or perhaps a town-hall, and thus its leading character and effect can be but little modified by the statue introduced under the vault of the base. The design contains solecisms also which ought not to characterize a national building like this—for example, each of its four fronts present a pointed gable similar, no doubt, to those of Melrose; but in that and other buildings worth quoting as examples, the pointed gable invariably indicates the termination of a roof, and it is quite unappropriate to introduce such a feature where a pointed roof neither is nor ought to be.

2. Upon the subject of your second query, the committee have already obtained a professional opinion from a gentleman of the greatest eminence. I do not, therefore, feel warranted in entering upon it. Some of the preceding remarks are, as you may observe, somewhat different from those of Mr. Burn; but on an occasion such as this, I do not imagine that a full expression of opinion on matters of mere taste can give cause of displeasure to any one. I may be permitted to observe, however, that it does not appear that the committee have employed Mr. Burn to make a formal and detailed professional examination of this subject, which is much to be desired; it is an exceedingly complex one, and the object in view is to provide not merely an ordinary, or even a great degree of security, but the highest practicable solidity, so as to guarantee an indefinitely long endurance.

3 and 4. The best materials for building, both as regards beauty and durability, to be found in this quarter, is the Craigleith stone, and that, I humbly think, should be used in the erection of such a monument. The Binney stone is softer, and probably less solid; at all events, we have not sufficient experience of its durability, and this monument is not a subject for experiment.

I am sorry I cannot answer your inquiry as to the probable cost of the design, for neither has there been time for this, nor do the drawings which I have seen afford the means of ascertaining the point.

In conclusion, I trust the committee will do me the justice to believe that in thus freely, though rather hurriedly, and perhaps imperfectly expressing my sentiments, I am very far from presuming to impugn their taste, their judgment, or their motives, for all of which I have the sincerest respect.

Being called upon by you, as a member of the sub-committee, will, I hope, exempt me from the charge of intrusion; and having decided to answer your call, I have thought it best, as well as most respectful, to express my opinions without reserve.

I am, &c.,

To Robert Cadell, Esq., &c. &c. &c. THO. HAMILTON.

TO THE EDITOR OF THE COURANT.

Royal Exchange, 30th March, 1838.

Sir,—As I feel a strong desire to see the admirable design of Mr. Kemp for Scott's Monument erected, permit me, through the medium of your valuable paper, to offer a few hints respecting certain objections which have been made to it by some of the members of the committee at their meeting of Wednesday last. I refer especially to the remarks of Lord Meadowbank, which I shall endeavour to show are, in some instances, founded on a misapplication of the relative proportions of different buildings, and in others, in a misconception of the design. This is more especially necessary in justice to all parties, as any remarks from his lordship, so distinguished for his patronage of the fine arts, are calculated to carry great weight with the public.

Respecting the proportions of the building, "Lord Meadowbank reminded the meeting that the height of it was to be 138 feet, and the abutments of the base were precisely the same size as the abutments in Canterbury Cathedral, but the height of Canterbury Cathedral was 230 feet. One or other, then, must be out of proportion." The objection here seems to be, that the "abutments" (more properly the piers) of Scott's monument are too large.

Now, even admitting the accuracy, in every respect, of the statement, we have to remark, that the two buildings are totally different in character and arrangement. The "abutments" or piers of Canterbury Cathedral are under cover of the roof, and are surrounded by the piers of the nave and choir, and therefore partake of the same light character. What would be their effect were the roof and surrounding buildings removed, and the whole height of the tower, resting on the four slender piers, exposed to view? Now, Scott's Monument is in this condition, and the piers must necessarily, therefore, have a massive and solid effect in order to harmonize with the superstructure. And when his lordship states that the piers are precisely the same size as those of Canterbury, it must be admitted that they are substantial. Do they appear out of proportion to the superstructure? That has never been hinted at, and, therefore, a comparison with Canterbury, or any other building, is singularly misplaced.

Lord Meadowbank, in the course of his speech, states, "that the thickness of the walls up to the second and third floors was only one foot three inches, not half the thickness of an ordinary dwelling-house, and in the two tiers above, the thickness was only eight inches." "Such a structure," it is added, "would not stand one of our tempestuous winters." Now, with all due deference to the opinion of Lord Meadowbank, I would respectfully submit

[illegible] his lordship [illegible] of the design, for there is not a single part of the building that can with any propriety of language be called a "wall." It is composed of an assemblage of massive Gothic pillars, buttresses, pinnacles, and turrets, arranged in such a scientific manner as to call forth the high approbation of Mr. Burn, who "expressed his great admiration of the elegance of Mr. Kemp's design, its purity as a Gothic composition, and more particularly the constructive skill exhibited throughout, in the combination of the graceful features of that style of architecture in such a manner as to satisfy any professional man of its principles, and the perfect solidity which that structure would possess when built."* No doubt some of these massive turrets are pierced for the small spiral stair leading to the top of the tower, the outer casing of which must be the walls referred to by his lordship; but this does not weaken these turrets in the least. The opposite sides, which are formed of stones of one piece in thickness, are bonded together by the steps of the stair, and rendered, if any thing, more durable than if built solid. The slender piers of the magnificent bridge at the Dean were built hollow, and united by bond stones in this manner, purposely to render it more durable. And the only turret remaining of the magnificent Abbey of Arbroath is the one which contains the stair. The thickness of the casing of the spire of Glasgow Cathedral, the drawings of which now lie before me, is only about eight inches, and has endured for many centuries, and is now as stable as when built, and that although not united by bond stones or steps of any description.

Many of the smallest turrets of Melrose Abbey, the prototype of the monument, are as entire as that day they were erected, when the massive walls of the border towers have crumbled into ruins.

On the whole, the controversy on the merits of this design seems to be contracting within very narrow limits. It is stated by Lord Meadowbank himself that "he did not mean to enter the lists in point of taste with the hon. gentleman opposed to him." This appears to be an admission of the beauty of the design. The question of originality seems conceded, for it is added that "his lordship had the authority of Mr. Burn for stating, that there was no instance of towers being constructed with open arches on all sides."—"It might be good taste, but *it was a new taste*."

In a letter from Mr. Hamilton, in reply to some queries which Mr. Cadell had addressed to him, he states that "Mr. Kemp's design was a *little* resembling the *Tower of Antwerp*," and that "it was *something like*" Mr. Hamilton's plan for the spire of John Knox Church, itself confessedly a copy of Antwerp, "from drawings and measurements made on the spot."

The objection as to the obscurity of the architect seems also to be given up, for Lord Meadowbank finely remarked, that "he did not believe there was a man in the room who would not rather encourage the architect on that account."

Should the remarks now submitted tend in any measure to remove the objections of his lordship as to stability, the question would seem to be brought to a conclusion; and I earnestly hope that at the next meeting the committee may approve of the recommendation of the sub-committee, as beyond all controversy the mass of the subscribers are in favour of a combination of architecture and sculpture.

I am, &c.

D. C.

[A paragraph which has since appeared in the papers, informs us that Mr. Kemp's design for the monument is to be adopted, and that the statue is to be executed not by Sir F. Chantrey, as was proposed by Mr. Cadell, but by Mr. Steele.]

* Report of Sub-Committee.

The Steam Engine; its Invention, and an Investigation of its Principles, for Navigation, Manufactures, and Railways. By Thomas Tredgold. Enlarged and edited by W. S. B. Woolhouse, Esq., F.R.A.S. Part I., with 60 Plates. London: John Weale.

The name of Tredgold is held in high estimation by all who have to do with the subjects on which he wrote. And very justly: an intellect which could bear up against the apparently unfavourable circumstances of his early life, steadily persevering in a systematic course of diligent self-improvement, and ultimately raising itself to the proud pre-eminence which at length it gained, must have been one of no ordinary standard, and capable of no ordinary achievements. Born in a humble station in life, favoured with no advantages of education but such as his native village afforded, apprenticed early to a cabinet-maker, and employed for five years more as a journeyman carpenter and joiner, it was his own diligent application to studies little cared for by most in his line of life, that cultivated his natural talents, and at once brought them into notice and fitted them for useful and honourable exertion. To these five years of manual labour for his immediate subsistence, and of hard mental toil, by which he laid the foundation of his future fame, succeeded a period of higher employment and greater advantages for his own improvement, in the office of his relative, Mr. Atkinson, an eminent London architect. To this gentleman Tredgold owed much of his future reputation. In his office, in his house, in his library, in the eminent professional characters to whom he was thus introduced, the young engineer met at the same time with the means of perfecting his professional acquirements, and the strongest incentives to labour after professional distinction. And that he did diligently use his increasing opportunities of acquiring knowledge during the seven years that intervened between his removal to town and the publication of his first work, must be apparent from the rapidity with which his works followed one another: important, well-digested, standard works, as they have proved themselves to be. It was during this period that he exhibited that remarkable instance of his intellectual determination and perseverance—the teaching himself the French language, as the key to the treasures of French science. We add the dates of his works: their titles and contents we need not dilate upon, text-books as they are in the profession.

Elementary Principles of Carpentry	1820
Practical Essay on the Strength of Cast Iron .	1822
Treatise on Warming and Ventilating	1824
Treatise on Railroads and Carriages	1825
Work on the Steam Engine	1827

Not to mention several well-known articles with which he enriched the "Supplement to the Encyclopædia Britannica;" new editions frequently called for of his preceding works; and other minor contributions to the stores of scientific information.

With an intellect so active, and so rich in the treasures amassed by a long and unremitted course of study, death alone could have intercepted the series of valuable works which the world expected, and which Tredgold designed. He left behind him plans for future literary labours so numerous, so comprehensive, and so various, that we cannot enough admire the activity of mind that could embrace so wide a range of subjects. Nor do we doubt, that with longer life, our author would have executed, with his wonted ability, much of that which he planned. Counted by years, his life was short; the very activity of mind which makes his intellectual existence, as seen in his works, appear long, prompted him to labours which wore out his bodily frame before his time. To his family and friends indeed his loss was premature, and deep and lasting is the affliction which it has caused; that well-earned professional reward which the father was beginning to reap, unhappily the children have lost by his early death. Whether the interests of Science might have gained by Tredgold's labours in her cause, having been strewn less thickly over a longer course of years, is perhaps doubtful. She has, at least, abundant reason to own, that to few of her sons is she more deeply indebted for the services of their lives, however long, than to him who wore himself out in her cause at the age of forty-one.*

Highly useful and important as are in general the works of Tredgold, we do not hesitate to place in the foremost rank, for utility and value, his work on the Steam Engine. Beginning with a short but comprehensive history of the several discoveries and inventions by which the wonder-working machine has advanced gradually to its present comparatively perfect state, our author proceeds to investigate the principles on which its action depends in the nature and properties of steam; the best proportion of parts by which these properties may be most effectually brought into play in conformity with those principles; and finally to exhibit some of the many applications of the full-grown giant to mining, to manufactures, to locomotion by land and water. Like all Tredgold's works, this is eminently a book for professional men, as affording the soundest and best professional knowledge. But besides, the work on the Steam Engine, is pre-eminently a national work; being confessedly the best philosophical treatise on the construction and uses of our great national glory in mechanical science, the honour of whose invention, as a practically useful machine, we eagerly claim and pertinaciously defend, and whose mighty effects we constantly feel infusing vigour into the heart, and giving vitality to the members of our widely-extended empire.

The earliest application of the steam engine was, as is well known, to the raising of water and draining of mines: even the Marquis of Worcester's scheme had this for its object, his "fire water-work" being, as he expressed it, "an admirable and most forcible way to drive up water by fire." The progressive improvements of the machine have extended indefinitely its use in these respects. By its aid, our miners have penetrated deeper and deeper into the bowels of the earth, and brought up richer and richer mineral treasures. In the "lowest deep" of one age, the mechanical improvements of the next have opened still "a lower deep," not "threatening to devour," but disclosed to bless. So also, in the other department of water lifting, the steam engine has been progressively more and more employed for the distribution of water for civic and domestic purposes. In our cities and large towns, how extensive the ramifications of the water-ways through which it pours its purifying and health-giving streams. The apparatus is, indeed, less picturesque and imposing than the aqueducts of classical times—less poetical than the morning and evening proces-

* An interesting Memoir of Tredgold appeared in the "Scientific Advertiser," No. 3, February 20, of this year. To this we are indebted for the facts given above.

sion of maidens with their water pitchers to the wells, which even yet issues from the gates of Eastern cities; but how much more effectual to the production of health and comfort—the main objects after all—is clearly proved by the statistics of modern cities, as compared with the accounts which we can gain of ancient ones. Still more striking perhaps is the contrast, when we compare the state of our own great towns, supplied in every part with water, in respect of health and cleanliness, with the filth, and its consequent wretchedness and disease, described by travellers as existing at the present day in the cities of the East.

Widely, however, as the original use of the steam engine has been extended, it is probable that the raising of water would be one of the last of its many occupations that would occur to an observer of its applications at the present time. The beautiful contrivances of Watt for converting the alternate and irregular play of the beam into one steady and equable rotary motion, fitted this mighty power for operations of manufacture, endless in number, and multifarious in kind. How shall we classify the works of our factotum giant? Set him to spin, and with strength and skill superior to that of Hercules of old, when Love put into his hands the distaff, he will run you off a yarn which our grandmothers, with their best spectacles, could not have achieved; or, if you please, will with equal ease twist you a cable fit for your proudest man-of-man to trust to in a gale. Set him to weave, and he cares not whether it be the muslin, or the bobbin-net for ladies' ornament, the shirting or the broad cloth for our industrious artizans, and enterprising merchants, and lordly landowners; or the canvass broad and tough, to clothe the lofty masts of our proud navy, and bear our name to every clime of earth. He will roll out for you the iron bar, strong and stiff, fit string to the gigantic bow with which you design to span a noble river; or draw you a wire so fine, that you may weave a gauze so light, that one would swear it is not metal. He will turn for you your lathes, truly and steadily, whether they be loaded with the massive cylinder and weighty axle of engines yet unborn; or whirl lightly round, turning off by dozens the little bobbins on which future thread is to be wound, the "newest article" of the linen-draper's shop. Pass between his powerful rollers the stubborn iron, and out it comes, the thick and uniform boiler-plate, calculated to resist the utmost force of steam; or the smooth and wafer kind of substance which the Birmingham artist moulds into fitting forms, and decks with lively colours in the various kinds of japanned ware. Or try him with another material, give him the dirty rag from the dunghill; he will beat it, and wash it, and tear it, and grind it, and roll it, and dry it, and size it, till out it comes the clean white paper fit for writing, printing, reading, or whatever you please. In short, it would be hard to name a branch of manufacture to which the steam engine has not lent its aid; impossible to mention one which that powerful aid has not improved and extended. It is by this means that we have been enabled, in many instances, to cope with foreign competitors in manufactures for which they enjoyed superior natural advantages; to surpass them far in many others, where their sole but great advantage is the cheapness of their labour. By this means it is, that far as our arms have spread the fame of Britain, farther still have reached her manufactures; and tribes who have never fled before the bravery of her troops, have been clothed, and fed, and humanized, by the ingenuity of her artizans and the enterprise of her merchants.

Nor have the triumphs of steam been confined to the land; not content there to have gained the victory over wind and water power, leaving the windmill to stand bereft of sails, and the water-wheel to gather moss and lichens, while he erects in triumph his sooty head, and earns his black bread by grinding the corn which he has taken from them, he has dared to pursue them to their peculiar domain, and contest with them the empire of the sea. At first, indeed, his exploits were small and cautious; like the timid navigators of old, he crept along the shore, nor ventured out of sight of land. In these experimental cruises, however, he showed his peculiar powers, his punctuality especially, his carelessness of his old rival the wind, his scorn of the power of water, though brought against him in the shape of tides. The increase of our steam navigation has of late years been astonishing. This power has done far more towards uniting us with the continent than could have been the case had we re-purchased the ancient French dominions of our crown at the price of our modern improvements in science. To our sister island, also, we have been bound in closer ties of mutual interest, than conquest or law could have knitted for her. The navigation of both Channels has become in fact as certain and calculable, as formerly it was precarious. Similar effects have attended the more recent establishment of steam communication between our own remoter ports, and various less easily accessible points of the continent. The first accounts of the experiment of steam communication with India too, are favourable so far as that they have effected a vast saving of time in the conveyance of letters; though perhaps it is not possible at present to rely positively on the unfailing punctuality of the arrangements. And last of all the "Sirius" and the "Great Western" have ventured on the wide Atlantic, freighted with good hopes from many, with good wishes from all, who are interested in watching the progressive triumphs of science. We may possibly, before we go to press, have heard tidings of their progress from some recently arrived packet, which crossed them on their path; at any rate, another month will enable us to judge and report on their success.

Though last, not least among the triumphs of steam, we hold his achievements in locomotion on land: he has long submitted quietly to have his strength estimated by horses' power; but now he seems determined to show his power to be above the speed of horses, as before he did that it was beyond their strength—to beat them off the roads, and leave it perhaps to the antiquaries of a future age to discuss what meaning to assign to that strange and obsolete word which figures so frequently in the records of locomotion in early and barbarous times. But not unnecessarily to anticipate the future: the railway system has stood, under the full view of the world, the test of an eight years' trial on the Liverpool and Manchester line, to say nothing of earlier experiments. The triumphant result of the trial is apparent in the completion and practical working of many hundred miles of railway in the British islands, on the Continent, and still more in America; in the works in progress on very many hundreds more, which are by degrees enlarging the domains of steam, as their successive portions are completed. The system must and will go on, despite of all obstacles which the inexperience of their friends and the prejudices of their enemies throw in the way of all new systems. The great effects which will follow from its extensive adoption, we are not here to predict; but hat they will be great, all analogy warrants us in concluding.

From a sketch even so rapid and incomplete as the present, of the progress of steam of late years, it will be apparent that so active and vivacious a subject will require an industrious and attentive pen to chronicle his doings. To borrow an illustration from trade, where the entries in the day-book are so numerous, so various, so important, it will require no slight exertion and diligence to keep the ledger posted up to the current month. Let even a Tredgold give the latest philosophy of the steam engine, the newest and best modes of construction, the most useful and striking applications; yet, pass some ten or a dozen years, and much must be added to make all complete, especially under the latter two heads of the subject. A conclusion so obvious from the progress of science and art, since the previous edition, has been carefully borne in mind by the publisher; and we are happy to see that he has been successful in the choice of an editor, well qualified for a task of no small difficulty. Mr. Woolhouse is already well known in the scientific world by his papers on scientific subjects; and we are happy to see that the volume before us is enriched with an ample Appendix on the important and interesting subject of Steam Navigation. We mention this as the most visible feature of the new edition, striking the eye on a cursory inspection; in a future number, we intend to return to the subject, and enter more into particulars. In the mean time, we congratulate the publisher on the eagerness of his subscribers and the public, which have led him to bring out first the part before us; and to express our hope and conviction that he will find no reason to regret the very liberal style in which he has got up the present edition of this most valuable work.

A few Plain but Important Statements upon the Subject of the Scheme for supplying Leeds with Water. By Henry R. Abraham, of London. March, 1838.

It was our original intention to make some remarks respecting the supply of water to the town of Leeds, having heard some extraordinary statements respecting the evidence which was given before a Committee of the House of Commons last session. We fully expected that we should be able to obtain a sight of this evidence; but up to the present time we have not succeeded in procuring it, and this is the reason of our silence on the subject.

The above pamphlet, which comes from one of the disputants, is very ably written, and contains much valuable and practical information relative to water works. We shall not enter into the disputed question for the reasons before stated, but shall simply confine ourselves to laying before our readers rather a copious extract from the pamphlet, and leave them to judge for themselves of the merits of the case:—

* * * * *

I shall now investigate the subject for you in the plainest manner; and I will give the utmost latitude to my calculations in favour of your scheme.

You have stated, that before the works can be completed 210,000 persons will require water.* In London, the very smallest average quantity supplied for each person is twenty gallons *per diem*;† while the quantity supplied by

* Mr. Leather's evidence in the Committee of the House of Commons.

† The South London district—the ill supply of which was noticed in Parliament.

the New River Company averages forty-eight gallons; and even this supply is found insufficient to meet all demands. Let us, however, take the smallest of these *per diem*, 4,200,000 gallons will be necessary.

It is, however, imagined, that the Leeds people will use *much less than the worst supplied of the London districts!*—Why, I know not. Nevertheless, Mr. Leather states, that 1,200,000 gallons, or about half that quantity, would suffice; and as it is not pretended that Leeds can have more than this quantity of water, we will proceed to inquire from whence can be obtained the 1,200,000 gallons *per diem*, or 70,080,000 cubic feet per annum.

At Eccup and Alwoodley, near Leeds, there are springs of water whose conflux yields a run of 230 gallons per minute, independent of any assistance from rain: this gives 19,395,947 cubic feet per annum. It is asserted that the country converging round these springs affords 1,200* acres of drainage, and will assist to complete the quantity of 70,080,000 cubic feet. We must therefore ascertain, first, the quantity of rain which will every year, at the minimum experienced data, be likely to fall upon this tract of land.

We must next ascertain what quantity will be lost in filtration, irrigation, and evaporation in its meanderings and lazy percolations towards the reservoir, and then, by well-known approximate rules, deduct the quantity evaporated in the reservoir.

1st.—The fall of rain, which I will compare with that of the district in question, shall be that of a very wet adjoining county, Lancashire, for which I have accurate observations for twenty-two years,† the lowest of which is 20·4 inches. In order, however, to avoid the charge of taking an extreme case, I will take the next lowest year, or 26·6 inches, and calculate from the average of the two, we then have 23½ inches fall of rain.

Let us examine next the fall of rain in Yorkshire.

	Inches.
York‡—Professor Phillips gives for 1833-34	25·7
Mr. Cholmeley's, at Brandsley, twelve miles from York, northward, upon ground higher	24
Middlesex—1836§	23·9
General average (London and Yorkshire)	22·1

The fall of rain is occasionally in Yorkshire 20 and even 18. If, therefore, we adopt 23½ inches fall, we shall not estimate from an extreme occurrence, but from one far above that which prudence should induce us to rely upon.

Now, 1,200 acres of ground, 23½ inches deep in water, gives per annum 639,787,500 gallons, or 102,366,000 cubic feet. From this the natural consumers—evaporation and filtration, will first have their share; and irrigation and husbandry must also be satisfied.

Evaporation scarcely ever stops; it goes on winter and summer, day and night, in frost and snow—ice passes into vapour as well as the shallow waters which waste in the summer's sun. While the rain is pouring into water, vapour flies rapidly from it.

In fact, evaporation is and must be equal to the fall of rain.‖ The quantity of water arrested in its progress by grass, weeds and fallow land, and that which penetrates through sandy fissures deep into the bowels of the earth, for the supply of lower levels, is considerable. Were it not for this wonderful arrangement of the All-Wise, our valleys would be swamps—our rivers torrents, rushing through deeply cut ravines—our hill-sides dry wastes. The observations of disinterested men of science, the research of those anxious to benefit mankind, enable us to form approximate estimates of the quantity lost by these causes.

I have collected them for my own instruction—I lay them before you for yours.

After a shower of rain, evaporation proceeds most rapidly, and while the quantity fallen dribbles to its lowest level on an extended surface, the motion favours the process, and the loss is very great.

In the case before us, the country presents a surface which is an eager recipient of wet, and excepting only a few tables of clayey land, which are undrained, and which suffer the water to pass away altogether in evaporation, it absorbs quickly. Numerous seams of coarse grit, the debris of the surrounding hills, and beds of porous irony loam, in great extent, occur in the valleys, quickly carrying away by filtration the rain as it falls. After a very mature investigation of these local features, and with great anxiety to promise as large a supply as I dared to expect, I could not infer in the estimate which I laid before the town, that one-half the fall of rain on such a country could enter a reservoir. The actual quantity to be received into the reservoir will be considerably less than one-half; but we will calculate that one-half shall, by good management, be secured, or 51,183,000 cubic feet.

We will now proceed to fix the loss in the reservoir: the quantity of rain which falls as is well known, varies in abundance, according to the season; that is, a large quantity will fall in autumn—a small quantity in spring and winter. Evaporation also varies: in summer height $\frac{3}{10}$ of an inch being the quantity vaporized each day; in autumn and spring $\frac{2}{10}$, and in winter $\frac{1}{20}$ of an inch *per diem*. This is less than allowed in canal works, but I wish to make your prospects as bright as possible. From observations made for thirty-four years,* it has been ascertained that in winter and spring about $\frac{1}{5}$ in each quarter of the annual fall occurs, in summer $\frac{1}{4}$, and the remaining in autumn.

	Cubic Feet.	Cubic Feet.
Brought forward		51,183,000
Allowing then for winter $\frac{1}{5}$ of the quantity in cubic feet, then $\frac{1}{20}$ of an inch in surface, taken over thirty acres, for ninety days, the reservoir being forty-five acres in capacity, but not full, *the evaporation will be*	490,050	
Spring $\frac{1}{5}$ of the quantity again, less $\frac{2}{10}$ of an inch *per diem*, over an increased surface of reservoir, say thirty-five acres for ninety days . . .	2,286,900	
Summer $\frac{1}{4}$ of the quantity over a still increased size, say forty acres, because it is now exposed in two reservoirs, for ninety days, at $\frac{3}{10}$ of an inch *per diem*	3,920,400	
Autumn, the remaining quantity over forty acres, for ninety-five days at $\frac{2}{10}$ of an inch *per diem* .	2,758,800	
		9,456,150†
Total quantity of rain in cubic feet per annum		41,726,850
To this add the quantity supplied by the springs		18,501,120
Making a total of rain and spring-water per annum		60,227,970

But this will not supply the minimum quantity of 1,200,000 gallons *per diem*, although not a minimum fall of rain.

Thus, at starting, there is a deficiency *per diem* of 27,000 cubic feet, or 168,750 gallons. Having ascertained that in round numbers 60,250,000 cubic feet may be attained in the course of one year, let us examine in what way it is to be appropriated for use by Messrs. Leather and Fowler.

A reservoir is to be formed at Eccup, *forty-five acres in area, which is to be* 46½ *feet in depth* at the dam-head, and capable of holding about 250,000,000 gallons. The conduit from this is to be two feet from the bottom,‡ and the conduit itself thirty inches diameter, and it should have a head of a foot to work with; then above 7,000,000 cubic feet must be deposited before the service can be carried on with regularity. At Weetwood another reservoir is to be formed. Before any water can flow from this reservoir, 3,500,000 cubic feet must be deposited below its service pipe. Therefore, including water in transitu, about eleven millions cubic feet lie stagnating and evaporating in perpetuity.

Without commenting on this most eccentric method of supply, we will imagine all ready to receive the springs and rain. To give every advantage to the case, we commence in the wettest season, autumn—

	Cubic Feet
Then twelve weeks run of springs will yield	4,625,280
And twelve weeks rain, less the evaporation, will yield . .	13,696,260
First quarter's supply	18,321,540

The service may now commence, and after deducting the eleven millions cubic feet necessary for the action of the works, there is left as available stock nearly 7,500,000 cubic feet.

Next, after the wet season, however, follow two dry quarters, and they will not afford even the reduced average, daily quantity, without draining from stock. A quantity must therefore be secured from the stock, which is now at its maximum.

		Cubic Feet.
The winter and spring demand for 180 days . . .		30,799,800
While the product of the springs . . .	9,250,560	
And rain together for both quarters, is only .	16,688,950	
		25,939,510
Deficiency		4,860,290

Leaving the above deficiency to be supplied from the stock, which is now reduced to 2,639,710 cubic feet. Summer next arrives, requiring

		Cubic Feet.
Ninety-five days' supply, or		15,675,760
The fall of rain and the springs	4,625,280	
Conjointly furnish	16,688,958	
		21,314,238
Excess of supply		5,638,478

Thus the year being ended, the reservoirs do not contain 8,000,000 cubic feet conjointly, ready for service, although they had three months' supply poured into them to start with; and it is obviously plain that the only water which can possibly lie in them, will be the excess of the wet quarter, which is to assist the dry seasons, and this excess we will find by deducting the demand from the supply of the autumn quarter.

	Cubic Feet.
The supply is, as we have already shown, for the wet season .	18,321,540
The demand, or rather the regularly assignable portion for ninety days, of 1,070,439 gallons per day, is . . .	14,850,720
	3,470,820

* There are not, however, 1,200 acres for drainage. Upon my survey, I calculated no more than 1,050, and I comprehend a larger practical district.

† Hanson's Meteorological Chart. ‡ Report British Association.

§ Scientific Register.

‖ Those who are not accustomed to observe large quantities of water, are apt to regard evaporation with equal *nonchalance* to that which a coachman views the steaming of his horses. Thus Mr. Leather ADDED THE DEW; stating that the rain was thirty-one inches, and the dew five inches, which equals 36.—*Vide* his Evidence at Westminster.

* Howard's Climates. † This is an extreme quantity.

‡ Mr. Leather's evidence.

But Oldman's reservoir at Weetwood, by the evidence, is to hold 3,500,000 cubic feet to the service pipe, and it will take a further quantity of 4,000,000 cubic feet to fill it; there will be but 4,000,000 cubic feet water at any time for store in the Eccup reservoir.

If there be a shadow of truth, an approximation even to fact, in the foregoing, what can justify the formation of a reservoir covering an area of sixty acres, forty-six feet deep, capable of retaining about 250,000,000 gallons, and costing, if properly constructed, a sum of not less than 25,000*l.*? and what can justify the pledge that 1,200,000 gallons *per diem* shall annually be sent to Leeds? Beyond all, in what way will Mr. Leather convince you that, from the same capacity of source, 2,000,000 gallons *per diem* shall be sent to Leeds when the town demands that quantity? If the Eccup source will supply 2,000,000 gallons in ten years' time, it can do so now. Let it be granted that the next year's rain, instead of the moderate and safe calculation just adopted, mounts up to Mr. Leather's quantity *(but without the dew)* i. e. thirty-one inches daily. Even allowing this, the supply could not be effected, because the amount of rain and springs is then only 73,500,000 feet, and the demand is 70,000,000 feet; but there must be 3,000,000 cubic feet in Oldman's reservoir up to the service pipe, and 7,000,000 in the Eccup, so that a deficiency exists which, without the DEW, cannot be made good, and nothing is left for the reservoirs.

* * * * * * *

I will now briefly sum up the points for which I have begged your attention, in order to show that neither data nor calculation has justified the projected outlay or scheme—that in fact no investigation has been made at all in the matter.

There is no evidence to show that 1,200,000 gallons *per diem* will be sufficient for the town, as a general and universal supply; but, on the contrary, practical experience shows, that if the *poor* are to be supplied, streets watered, and fires extinguished, more than 2,800,000 *gallons* will be necessary.

Mr. Leather states, that in ten years the town of Leeds will require 1,800,000 gallons *per diem*; but, by the same comparative scale, the least required quantity must be 4,200,000 gallons. It has been shown, however, that only 1,031,000 gallons *per diem* can either now, or at any future time, be depended upon from Eccup.

It has been shown that the reservoir at Eccup can never be filled; from whence then, in the first place, is the present supply to be had? and, in the second, in what way is the increased supply to be obtained?

If the source will only deliver 190,000 cubic feet *per diem* in 1837, how shall it deliver 288,532 in 1851,* when the increase will be required? But why, in the face of other towns requiring double the supply alleged to be necessary for yours, do you credit the representation that the less proportion will suffice? Examine this statement of what six of the London Companies supply *per diem*, and judge of its correctness.

Grand Junction, 72½ gallons; Southwark, 31; New River, 48; West Middlesex, 36½; Chelsea, 33⅓; East London, 24 gallons.

The average of these is more than forty gallons *per diem* for each individual, and can you credit that the Leeds necessity, with all its smoke and dirt, shall require only one-fourth of such a quantity?

* Mr. Leather's evidence.

A New System of Scales of Equal Parts, applicable to various Purposes of Engineering, Architectural, and General Science. By CHARLES HOLTZAPFFEL. London: 1838.

MR. HOLTZAPFFEL could not have done a better service for the profession, than turning his attention to the construction of scales suitable for their purposes. The difficulty of obtaining scales, accurately divided, has long been felt. They can only be obtained at a very few mathematical instrument makers, who charge a most exorbitant price for them. To obviate this evil, Mr. Holtzapffel has constructed scales of almost every description on card paper, divided by an engine, and which he is enabled to sell at the trifling sum of ninepence each. He also undertakes, at a small additional charge, to make any single scale, agreeably to order, when it is required for a specific purpose. We have for many years been in the habit of using scales made of paper, both for estimating and drawing, on account of their convenience; the objection to them is the loss of time in making, and also their inaccuracy, in consequence of being obliged to divide them by hand; these inconveniences are removed by adopting Mr. Holtzapffel's scales, which we certainly shall do in future. We have very carefully examined several of the scales, and have much pleasure in testifying their accuracy and utility. We very strongly recommend them to the notice of the profession, who, we doubt not, will very readily adopt them. They are not only made on card paper, but may also be had divided on ivory, brass, or other metal. Mr. Holtzapffel, in the above pamphlet, fully describes the utility of the various scales which he manufactures. We cannot do better than give the following extracts from his work, in explanation of their construction:—

I set out with the determination to economize to the utmost the mere fabric of the scale, by using the card paper which I had found to answer so well; to follow the method of dividing all the scales on their edges, so that there should be no occasion for the use of compasses, to the injury both of the scale and paper, making besides two operations in place of one; and to limit each scale to a single line of divisions, so as entirely to avoid the perplexity and confusion arising from the crowding together of several lines of divisions on the same piece of boxwood or ivory, which tends to distract the mind from the drawing, to which it ought to be exclusively devoted, to the instrument, which should be of no more concern than the fingers.

Card paper, the material selected for the purpose from its many appropriate qualities, possesses but one inconsiderable disadvantage, namely, its trifling change of length from atmospheric influence; as however this *same change* is as constantly going on in the paper to which the scales are applied, it rather deserves to be considered as a compensation than as a defect. But I shall presently speak of this more particularly.

On the other hand, the card scales possess the following advantages. *From the economy of the material*, we may obtain, for the same expense, an increased collection of longer scales on distinct slips, free from all liability to twist and warp; the sub-divisions, which are minute, extending generally over eighteen inches. From the *flexibility of the card scales*, we are saved the continual trouble of shifting the instruments from place to place on the drawing board, to make room for the entire length of the scale at any particular part; this quality likewise admits of their easy application to curved surfaces and lines. *The white card paper* offers the most striking contrast to the black lines, the scales are consequently very legible; and by using various light-coloured cards, different series of scales may be easily distinguished from one another. The nature of the material further admits of the employment of the printing-press or the pen, for any numbers, titles, or explanations; and also of the restoration of the edges two or three times, by careful cutting. *The card scales, being very thin*, offer but little impediment to the drawing squares which may be laid over them; and in shading drawings by means of equi distant parallel lines, this circumstance is very desirable, for regulating the uniformity of the ground. They are portable and compact, a large collection of them can be kept in the paper cases, with separate compartments provided for them, without confusion or injury.

The change of length in the card scales before alluded to, is only a comparative error, as all the materials employed in the construction of scales, and also in their ultimate application, are subject to the same defect.

On the continued examination of several scales, made from different sheets of card, some being exposed in rooms at the ordinary temperature, and others placed in the open air, the atmospheric variation in length was found in general to be about the one-hundredth of an inch in the foot, and in extreme cases three or four hundredths in the foot, from the standard. And on the inspection of a very considerable number of the finished scales, previously to their being made up in packets for sale, this was fully substantiated.

To avoid introducing this source of error during the process of manufacture, it may be observed, that the card is preserved in its ordinary dry condition throughout the same, and that *every individual scale* is ruled in the dividing engine after the figures have been printed.

But we must not forget to observe the variation which is going on at the same time in drawings. This may be easily done by any one. I took a sheet of drawing paper, and placing one of the card scales across the middle of the same, I made, very carefully, with the ordinary drawing instruments, two fine ink lines, partly on the card and partly on the paper, so as to be certain that the space between the lines was in the first instance the same. These lines were marked A A A A; similar lines marked B B B B, were made on placing the card at right angles to its former position; and the same thing was done with a wood scale, employing the letters C, D. The lines were about one foot asunder, and the papers, &c. (as I used several, marked in sets 1, 2, 3, &c.) were placed under the same circumstances for the twenty-four hours previously to making the test marks, to bring them to the same condition.

On exposing them alternately for a day or two to the damp open atmosphere, and to the dry air of a warm room, the lines made on the paper and the paper scales, in which the materials were similar, approached very considerably nearer to agreement than those upon the dissimilar materials, the paper and wood.*

We add the compensation balance to a watch, to adapt that measuring instrument to the change of circumstances under which it is placed; should we not, by parity of reasoning, employ a compensation scale, for the measurement of our drawing papers, one similarly influenced to the thing measured, from the identity of its fabric?

I am satisfied that a fair examination of all the circumstances, for and against the new card paper scales, will show them to be fully entitled to an extensive employment.

The Arcanum; comprising a concise Theory of practical, elementary, and definitive Geometry. By JOHN BENNETT, Engineer. Part I.

CONTAINING numerous diagrams in geometry, practically illustrated, so as to be easily comprehended by the student.

The Practical Mechanic's Pocket Guide. By ROBERT WALLACE, A.M.

The Practical Engineer's Pocket Guide. Glasgow: W. R. M'Phun.

VERY cheap and useful works, containing a great deal of valuable matter, condensed in a small compass. The former is a concise trea-

* The mean difference between the paper and the paper scales in 250 observations was ·0051, whilst that between the boxwood and the paper was ·0126, under precisely the same circumstances, or nearly 2½ times as much.

tise on the prime movers of machinery, and the weight, strength, and strain of materials; accompanied with numerous rules and tables. The latter treats in a similar manner of weights and measures, contents of bodies, centre of gravity, composition and resolution of forces, gravitation, pendulums, elements of machinery, friction and other resistances.

The Sciences of Geology and Botany. Glasgow: W. R. M'Phun.

Two useful elementary works, written in a plain and intelligible manner, easily understood by the uninitiated. They are published at the trifling sum of one shilling each.

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS.—No. 5.

THE CUSTOM-HOUSE.

Like that which formed the subject of my last paper, the building I have selected to speak of in this has undergone a very material change, although but a partial one, the alterations having been confined to the central division, in which is situated the Long Room. But the present case of metamorphose differs considerably from the one before spoken of, being by no means so happy a one. On the contrary, instead of gaining anything whatever, the original design has lost considerably by the transformation that has been made in it; losing, in fact, the only good and redeeming feature it possessed.

Taken as a whole, Mr. Laing's design exhibited very little invention or consistency. The centre, consisting of nine large arches above the basement, filled in with windows, and without any other windows above them, possessed character and propriety, and announced most distinctly that there, on the upper floor, was the Long Room. The large bridge-like arch below, forming the entrance to the King's Warehouse, was also a good feature, while the two long bas-reliefs, in the attic, between a space of equal extent, which was occupied by an inscription, gave an air of dignity and finish to the whole of the centre; which had, moreover, the merit of possessing some novelty of physiognomy. But after this the architect seems to have been quite *au bout de son metier*, being unable to devise anything either better in itself, or more original for the wings, or rather, extremities of his building, than the stale expedient of bedizening those parts with columns, between which are holes in the walls for sash windows. It avails little to urge that those columns, being copied from a pure Greek specimen, the Ilyssus Ionic, are beautiful, because all the merit a modern architect can assume to himself for such things, which are avowedly not of his own invention, depends upon the felicity with which he can make them in some degree his own, by tasteful appropriation of them in his design, and his rendering all the rest perfectly of a piece with them. Although a beautiful flower, a rose would be an exceedingly ridiculous appendage to a judge's wig, were it stuck upon that very venerable respectable head-dress.

I may be in error, nay, supposing some people to be in the right, most egregiously so indeed; but it certainly does appear to me, that wherever such adventitious decoration—as that of columns, without there is any evident necessity for them—is introduced, it ought, at all events, to seem absolutely called for; not, indeed, by the exigencies of the building, but by the character of the design. As far as that is concerned, they ought to appear essential to it. Instead of which, we more frequently than not find them resorted to, and dragged in for the nonce, as a mere shift—a shift, by-the-by, now sadly the worse for the wear—with the hope of thereby concealing the absolute inanity and poverty of the design itself, and its utter want of all expression and character. To stick up columns, where there is nothing whatever in any sort of accordance with them, is one of the commonest and most vulgar sins of which an architect can be guilty, and that to which dulness is sure to betake itself.

Most certainly, there was nothing in the design of the Custom-house to justify them; on the contrary, they served no other purpose than to throw the whole out of keeping, and to cause what would else have amounted only to plainness, to appear downright meanness of the most shabby and parsimonious kind.

There is no trusting to proverbs, unless they are interpreted with a little *nous;* notwithstanding which, architects are apt to put implicit confidence in the one that tells us, "fine feathers make fine birds." They would act more wisely—I might say they would act less absurdly, than they now frequently do—were they to call to mind the fable of the "Jackdaw in borrowed plumes;" for it cannot be denied that we have many buildings, which, notwithstanding they are bedizened out with columns of most classical cut, cut but a very sorry jackdawish figure themselves, and are some degrees more disgusting, ridiculous, and preposterous than they would be, did they show themselves forth to the world in their native, undisguised cockneyism. Can anything, for instance, be more exquisitely barbarous than the Church of All Saints, at Poplar, which certainly gives the lie direct to the proverb just quoted, proving by ocular demonstration, that Greek columns will not of themselves constitute a Greek portico, but, on the contrary, may be made to stand like sulky appendages to a building in which there is not a single particle of Grecian taste? By what piece of good luck that truly ignominious design happened to escape the pen of Welby Pugin, when hunting about after modern monstrosities, it is difficult to guess. However, I must not permit that egregious specimen to detain me now, but resume my professed subject.

The Ionic columns may, in some degree, be thought an excuse for there being no dressings to the windows, for the simple reason that they leave no room for them, the bare apertures having even now the appearance of being squeezed into the spaces between the columns, and quite cribbed up; yet surely this was of itself a sufficient reason, let alone every other, why there should not have been columns at all; for, surely, if they can neither be made to accord with the plan decided upon, nor be rendered of any value in the design, it is on every account better to omit them, and to have recourse to some other mode of decoration. For what was thus worse than uselessly expended, all the windows, at least, might have been so embellished, as to keep up consistency of character throughout. Matters are made not at all better, but in some respects very much worse, by three of the windows in each of these divisions of the front, namely, those over the doors in the basement, having added to them, by way of ornament or distinction, a mean shelf-like cornice, supported on brackets, but without any kind of architrave around the opening itself; the effect of which is most paltry. Glaring as the solecism is, no doubt it has its admirers who consider it a beauty, since I find it has since been adopted in some of the ginshops about town, and other buildings of that kind. In them it is offensive enough, but here doubly so, because at utter variance with anything purporting to be in the Grecian style, or affecting even the slightest approach to Grecian taste. Our chief consolation is, that after all it merely constitutes an additional defect in what is so radically bad in itself; that a defect more or less becomes of very little importance as regards the building itself.

Let us proceed to examine Sir Robert Smirke's portion of the front, as altered by him, when he was called in to repair the damage it had sustained by the falling in of the Long Room, on the 26th of January, 1825. This middle compartment was, as I have said, by far the very best portion of the whole; it possessed character and propriety. It told plainly enough that there was the Long Room, occupying the whole extent between the wings. Well, what does Sir Robert do? Whether it was that he intended to give us satirical illustration of *reform*, I do not take upon myself to decide; therefore merely say, that if such was his intent, he succeeded admirably. At all events, the specimen he has here given us of architectural reform, is enough to make us sicken at the very name. Not content with removing what was good, he substituted for it a host of incongruities. In its first state the centre of the building accorded with the internal plan, and showed itself to be what it really is, one long and lofty room. It is now made completely to falsify such arrangement, by being subdivided into five portions, consequently suggesting the idea of there being as many rooms on a floor in that part of the edifice. So far, then, the exterior is a mere mask, and one of the least excusable kind, because it substitutes littleness for continuity and grandeur. It exhibits, moreover, that quintuple division of a front, observable in most of his other designs, viz., a centre portico, and an extreme compartment at each end, where the order is again resumed, after being omitted in the intervening divisions—as we behold in the Post Office, Covent-Garden Theatre, &c. Here, too, he has brought out a projecting portico, but with so little regard even to the appearance of utility, as to show that it is of no service whatever, there being no means of access to it from the room behind it, as the windows are several feet above the floor, neither is the centre one carried down externally so as to have the appearance of opening into the portico. From a near point of view, this, it must be owned, is not very discernible, because the bottom of the windows cannot then be seen. Yet then it is equally obvious that if it is not a sham one, but a *bonâ fide practicable* portico, where persons may walk out, they must not venture into it in other than a sober state, there being neither balustrade nor anything else to guard them from falling down. Well, but putting all utility out of the question, is it not a good architectural feature in itself? Verily, I think not; on the contrary, that it betrays much that is decidedly erroneous and defective, even in point of composition. In the first place, the number of columns here does not exceed that in each of the wings, which not only occasions monotony,

but also some degree of anticlimax. This colonnade should at least have been octastyle, if not more, in order to give some little degree of emphasis to the centre. It is true, that although hexastyle, like the other two, this range of columns is somewhat longer. Even this, however, is attended with an obvious defect, because these advanced and perfectly isolated columns are considerably wider apart from each other than those which, being quite close against the wall, would have better borne to be wider apart. In fact, the intercolumniation is not Greek, but is almost *aræostyle*, for the order, as any one may convince himself, by imagining a pediment over the columns, when he would find it much wider in its proportions than almost any other hexastyle portico we have. Let me not be told that the architect could not make his intercolumns narrower, being under the necessity of spacing his columns according to the piers and windows behind. Such a plea is not for a moment available, for, admitting that he could devise no mode of arranging the windows themselves differently, the question then to be answered is, what put it into his head to have columns there at all, since, as has already been shown, that so very far from answering any purpose, the colonnade boldly disavows any kind of utility? After this comes another question—why did not Sir Robert carry up the order here to the top of the building, increasing the diameter of the columns accordingly, and thereby decreasing the width of the intercolumns? Had he done this, and carried his colonnade the whole extent of the Long Room, the centre would then have preponderated, as it ought to do, in the composition. From his not having adopted this course, another grievous defect has arisen, for he has been obliged to introduce a kind of upper story—attic it cannot be called—above the order; so that the Long Room appears to be cut up all ways, horizontally as well as vertically, and the whole centre to be depressed by an excrescence on the top of it, quite as ugly as that on the top of the Mansion House, and not even one hundredth part so picturesque.

All this, it must be confessed, is exceedingly provoking and vexatious; the only consolation in the whole matter, is to discover how cheaply the reputation for classicality of taste may be earned, and how more cheaply still it may be maintained. Nothing whatever of the spirit of Grecian architecture is discernible throughout the whole; and what is still worse, we have nothing as an equivalent in lieu of it. On the contrary, there is a most puerile affectation of Greekism, which the architect has dragged in, without satisfying any demand of beauty, at the same time that he has violated common sense. Besides the reasons already adduced for the omission of columns, one very sufficient one was, that the colonnade must come where there would be windows behind it, unless he had chosen to light, if not the whole, the centre of the Long Room from the ceiling. Any man who understands anything of Grecian architecture, must also know how next to impossible it is to keep up its character, if windows must unavoidably be introduced within a portico or colonnade, and will therefore take care never to put a portico where he cannot get rid of windows. But, even, in the management of his windows, Sir Robert has committed a most egregious solecism, for while he has bestowed cornices upon those within the portico, he has left the three on either side of it comparatively bare and unprotected, having merely architraves; the consequence of which is, that this front to the Long Room, now cut up into five divisions (containing thirteen windows, instead of nine, as originally) looks all the more disconnected. In fact, it appears to have been a design for an entire front, taken and inserted between Laing's wings. Nevertheless, Mr. Wightwick says,—at the same time qualifying his opinion with a "perhaps"—"that the new centre gives a more harmonious character to the front as a whole;" adding, however, "but that the old centre, individually considered, was a far superior composition—simple, grand, and characteristic." Most undoubtedly, therefore, the best luck that can now be wished to Sir Robert's piece of architecture is, that it may take example by that of its predecessor, and fall down—yea, "leave not a wreck behind."

ON BUILDING MATERIALS.

No. I.—STONE.

It is reported that the Commissioners of Public Works are about to open a Museum, containing a collection of the various kinds of stone and other materials used in building, for the inspection of those architects or engineers who may be employed in the erection of public buildings. The importance and utility of such a measure cannot for a moment be questioned, and I trust that its advantages will not be limited to the architects engaged in national works alone, but that every professor of the science will be allowed the opportunity of inspecting the collection, and thereby becoming practically acquainted with the internal resources of his own country; indeed, when we consider the great importance of a thorough knowledge of the various materials used in the constructive arts, it becomes a matter of some astonishment that this plan should not have been adopted by the Institute of British Architects, or of Civil Engineers, long ere this, especially as such a collection might be made with but little comparative expense, and would soon be increased to a considerable extent by the donations of its various members. How little knowledge is to be obtained from books, and how few publications consider the value of this kind of information, is well known to the profession; and yet what numerous errors into which the young practitioner has frequently fallen, may be attributed almost solely to a deficiency of knowledge on this point. Until very lately, our architects and engineers have seldom extended their inquiries beyond the limits of their own immediate neighbourhood, and even those whose practice and experience have rendered them eminently qualified to give information upon those branches of their profession, have seldom communicated them to the world with sufficient clearness to enable others to profit by their superior knowledge. It is these considerations which have induced me, in the few following observations, to attempt a short description of the principal kinds of stone, which, in the course of practice, have come under my own notice; trusting that this example may induce others of superior knowledge and greater experience to communicate their more valuable information upon subjects connected with building materials generally. I shall attempt no geological classification, but shall confine myself to that style which is simple and intelligible to the humblest reader, while, at the same time, it will not (I trust) be quite valueless even to the most talented or experienced.

The great importance of stone in building may be inferred from the fact, that few if any nations have attained superior excellence in architecture where this material has not abounded; and it would not perhaps be too much to say, that had it not been for the granite rocks of Egypt, and the marble quarries of Pentelicus, we should never have had either the temple of Apollinus Magnus or the Parthenon; and there remains but little doubt, that the plentiful supply of these materials was one great cause of the superiority of those nations in the constructive arts. Great Britain abounds with almost every variety of this valuable material, from the hardest granite to the finest and softest limestone. In London indeed for many years Portland stone was almost the only kind used in building; Bath stone was afterwards introduced, about fifteen or twenty years back; and subsequently Park Spring, Bramley Fall, and many kinds of granite became common. But there still exist, in various parts of our island, vast quarries of different kinds of stone which are even now but little known beyond their own immediate vicinity. In the western parts of Kent, and the eastern parts of Sussex, sandstone abounds in great quantities; but it was not until Mr. Decimus Burton commenced building at Tunbridge Wells, that it became an article of general use. Within the last twelve years, the new churches of Tunbridge Wells and Southborough, the whole of Calverley Park, together with some hundreds of private buildings in that neighbourhood, have been erected of this stone; and although of an inferior quality, its introduction has greatly improved the character of the architecture of that locality. This stone is of a warm yellow colour, interspersed with streaks of deep brown or red, and sometimes curiously grained like mahogany. It is fine in texture, and stands frost tolerably, but absorbs moisture considerably. It does not become harder by exposure to the air, and is too soft to bear a very sharp arris. In building with it, it is usual to line the interior of the walls with four-inch brickwork, to keep them dry. This stone extends over a great part of Sussex, and is frequently found in vast fragments, presenting the most curious and grotesque forms.

In the more eastern parts of Kent, Kentish rag has been for many years the chief stone employed in building, and the excellence of its quality may cause some surprise that it has not been more extensively used. It is of a dark grey colour, of very firm texture, and great durability. The Asylum, the New Prison, and the New Church at Maidstone, have all been erected with it; and when well burnt, it produces a lime but little inferior to the Barrow lime of Leicestershire.

Proceeding from the south to the northern parts of Great Britain, we shall find still larger quantities of this useful material. In the county of Lancashire, the Runcorn stone was formerly much in use. Most of the public buildings of Manchester and Liverpool are built of this stone, which is of a pale, and sometimes of a deep red colour, coarse in grain, and frequently very soft. It comes principally from Runcorn Gap, Cheshire; but its use has lately been superseded by the introduction of the Huddersfield stone, from Huddersfield, in Yorkshire. This stone is of a very superior quality, and was used in the erection of the Royal Institution, the Infirmary, and many of the public buildings in Manchester. Its colour is light grey, its texture fine and compact, it stands the weather well, and bears a very sharp arris. Another variety of this stone, called the White Huddersfield, is used principally for inside work, and, in appearance, resembles the Block fire-stone, from Ryegate, Surrey. It is extremely hard, and fit for the finest work, but does not resist the action of the atmosphere so well as the former; it is

frequently used for window-sills and copings, but is most usually for stone-staircases, hearths, chimney-pieces, &c. The Alderley Edge stone is another variety, which has latterly come into great use in Manchester and Salford. This is a sandstone of excellent quality; its colour is a warm yellow, its texture uniform, and although not very hard, it will bear a very sharp arris. I employed it in the erection of several buildings in Manchester, and although not equal to the Huddersfield, it gave great satisfaction. It is principally procured from the quarries of Sir J. T. Stanley, at Alderley Edge, in Cheshire, about ten miles from Manchester.

Near the same spot are quarries of a coarse sandstone, called Summet stone. In appearance this stone closely resembles the Bramley Fall, which has lately come so largely into use in the metropolis; but it is more loose in grain, and although capable of resisting the weather to a great extent, is apt to split with frost. It is very useful for gate-piers, copings, &c.

Derbyshire alone abounds with vast quantities of almost every kind of stone necessary for the architect, the engineer, or the sculptor, from the coarse hard sandstone, almost equal to granite, to the fine-grained limestone, which will bear a polish nearly as perfect as marble. I have now before me no less than ten distinct varieties of Derbystone stone, all of which are excellent in quality, and as various as the names by which they are designated. The neighbourhood of Chesterfield abounds with various kinds of sandstone, the chief of which is of a reddish white, and sometimes of a deep red colour. The grain of most of these is coarse, but exceedingly firm and compact, and they stand the weather well. Of these kinds, the new church at Chesterfield, and many of the bridges of the North Midland Railway, are now erecting. Another variety is of a yellowish brown colour, much finer in grain than the former, and more suitable for nice work, but not quite so durable. In Darley Dale are quarries of limestone, from which vast masses almost of any required dimensions can be procured. Its colour is a light grey, and its grain exquisitely fine and hard. I am informed that the Birmingham terminus of the London and Birmingham Railway is about to be erected of this stone. In the more central and southern parts of Derbyshire are vast quantities of limestone, of the finest quality, and superior, I think, to that of Darley Dale. The neighbourhood of Matlock, Ashover, and Middleton, and many parts of the High Peak country, present immense rocks of this beautiful material. It is nearly white, and as fine as Italian marble. The Derbyshire shell marble is of this quality, and is thickly embedded with marine shells, and when polished, is equal in beauty to many foreign marbles, although so plentiful in Derbyshire that it is used to mend the roads, or is burnt into lime. I never remember seeing but one specimen in London, which forms the top of a table in the British Museum; although at Chatsworth, the beautiful seat of the Duke of Devonshire, some very elegant columns, &c. are formed of it. In some parts it is of a deep red colour, but most commonly grey and white, and is much used in the neighbourhood for chimney-pieces. Black marble likewise abounds in Derbyshire, but its quality is somewhat inferior.

C. L. O.

HAGUE'S PATENT HYDRAULIC MACHINE.

Specification of the Patent granted to John Hague, of Cable Street, Wellclose Square, in the Parish of St. George in the East, in the County of Middlesex, Engineer, *for Raising Water by the Application and Arrangement of a well known Power, from Mines, Excavations, Holds of Ships or Vessels, and other Places where Water might be deposited or accumulated, whether from accidental or natural Causes, and also applying such Power to, and in giving Motion to certain Machinery.*—Sealed May 9, 1836.

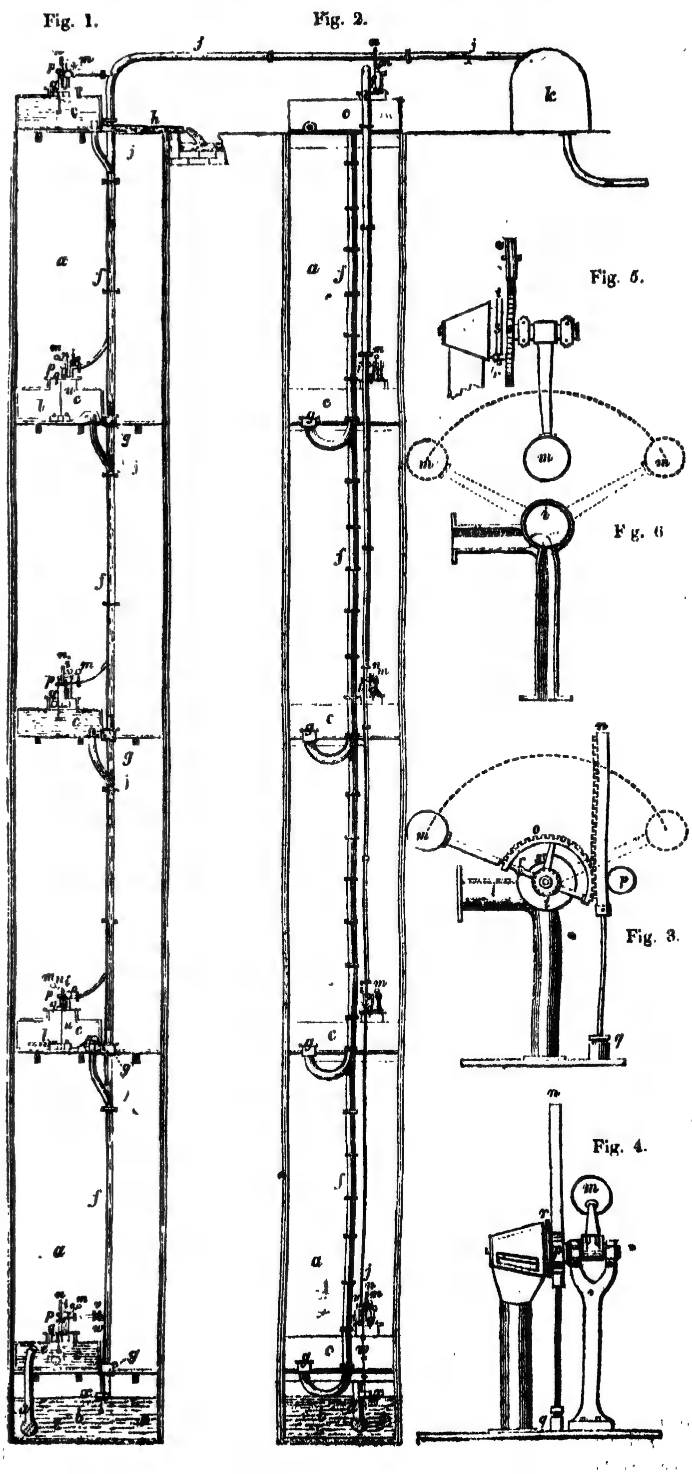
To all to whom these presents shall come, &c. &c.—Now know ye, that in compliance with the said proviso, I, the said John Hague, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained, in and by the drawings hereunto annexed, and the following description thereof (that is to say):—

DESCRIPTION OF THE DRAWING.

In the said drawing,

Fig. 1, is a vertical section of a pit or shaft of a mine, with my machinery affixed therein; and,

Fig. 2, an end view and section of the same apparatus. The letters of reference indicating the similar parts in both figures. A A, represent the pit or shaft. B, the water accumulated at the bottom of the shaft. C C C C C, close or air-tight vessels, tanks, or cisterns; these may be placed above each other at any distance under the atmospheric pressure, and may be made of any convenient shape or form suitable to the purposes required; they may also be made of cast-iron, or wrought iron, or of copper, wood, or any other fit and proper materials, which may be best calculated for the purpose, but I prefer cast-iron. D, is a metal pipe or strainer, which is also termed a suction-pipe or wind-bore, being perforated all over its lower part with holes to admit the water, but to prevent the passage of large bodies into the pipe. On the end of this pipe, D, is placed a valve, E, opening so as to suffer the water to flow into the tank or cistern, but also closing when the cistern is full, to prevent the return of the water. F F F F, are four pipes or rising-mains, the lower end of each being connected with a valve-box, G G G G, placed at the bottoms of the tanks or cisterns; their upper ends passing through the bottoms of the cisterns above them, and rising a little above the said bottoms. The valves in the boxes, G G G G, open forwards to allow the water to ascend through the pipes, F F F F, but close to prevent it from returning into the tanks or cisterns. From the uppermost tank or cistern, a spout, H, with a valve at its end opening outwardly, proceeds to discharge the water so raised to the surface: I I I I I, fig. 1, represent five three-way cocks and their appendages. These cocks are mounted in branch-pipes, which proceed from a main exhausting or vacuum-pipe, J J J J, which is connected with an air-



vessel, or receiver, K. This main exhausting-pipe is better seen, at J J, in fig. 2. The conical plugs of these three-way cocks are put into motion, in the following manner:—L L L L L, fig. 1, are five hollow copper boxes or floats of sufficient buoyancy to raise the balls of the tumblers, M M M M M, from their state of rest past their centre of gravity, and as shown on a larger scale in fig. 3, by the dotted lines. These floats are caused to slide freely upon metal rods, which are passed through holes formed in the centres of the floats. At the lower ends of these rods are formed stops, for the floats to rest upon when the water in the tanks or cisterns is discharged. At the upper ends of these rods are affixed toothed racks, such as that shown on a larger scale, at N, in fig. 3. These racks act in toothed sectors, similar to that shown at O, in fig. 3, and are kept in geer by the guide-rollers, P, at their backs. The rods pass through stuffing-boxes, mounted upon the tops of the cisterns, and as shown, at Q, in figs. 3 and 4. The tumblers, M M M M M, are each mounted upon a separate axis, turning in bearings, mounted upon standards or pillars, and as shown more clearly in fig. 4, upon each axis is also affixed the toothed sector, O, as is shown in fig. 3. Upon one of the arms of this sector, O, is affixed a pin, R, which projects within a circular gap, S, in the plate or flanch, T, affixed upon the conical plug of the cock, I, as shown in fig. 3. At each end of the gap, S, are stops, against which the pin, R, falls, when the tumbler, M, has passed its centre of gravity. Besides the stops at the bottoms of the rods, upon which the floats rest, there are also others affixed at a proper distance above, as shown at U U, in fig. 1. When the water is rising in the tanks or cisterns, the floats rise with it, and acting against the stops, U U, carry the rods upwards with them, and also the toothed racks at their upper ends, which, acting in the toothed sectors, O O, cause the tumblers, M M, to pass their centres of gravity, and fall against one of the stops in the gap, S, and turn the plug, I, of the cock, so as to shut off the vacuum and open the passage to the atmosphere. When the water is discharged from the tanks, the floats by their weight, and being lodged upon the stops at the lower ends of the rods, cause the tumblers to again act in the reverse way, and re-open the cocks, so as to shut off the communication with the atmosphere, and open the passage to the main vacuum-pipe, and as shown at fig. 6.

Fig. 3, is a front view of the cock and appendages.

Fig. 4, a side view of the same.

Fig. 5, a top view thereof, showing the tumbler by its pin or stud, R, acting upon the plug of the cock; and,

Fig. 6, is a section through the barrel and plug of the cock and the vacuum pipe shown upon a larger scale. The air-vessel or receiver, K, is connected or united with an air-pump or pumps, which is or are worked either by steam, water, wind, animal, or other power, or hoist mover. This receiver, K, may be placed at any convenient distance from the mouth of the pit or shaft, and be connected with the vacuum-pipe, J J, by extending that pipe accordingly. Or it may also be made to connect with several vacuum-pipes by similar means. At the lowest tank or cistern, C, of fig. 1, V, is a cock mounted in the branch-pipe, leading from the cock, I, to the main vacuum pipe, J. To a lever mounted upon the plug of the cock, V, a rod, W, is affixed at its further end. This rod descends through two guides affixed on the outside of the tank, C; it has a stop at its lower end, and another at a proper distance above it; upon this rod and between the stops a hollow copper float, X, is mounted, which can slide freely up and down between the two stops. This float lies upon the surface of the water in the pit or shaft, rising and falling with it. When the water gets so low as to allow the float to rest upon the stop at the bottom of the rod, the weight of the float shuts the cock, V, and prevents the suction-pipe, or wind-bore, D, from drawing air. When the water in the pit or shaft accumulates it raises the float, X, until it acts against the upper stop on the rod which re-opens the cock, and puts the machinery again into action, and which continues until the water again falls too low as above-mentioned. In case of a steam-engine being employed as a first moving power, an inverted syphon, filled with mercury, may be connected on one side with the main vacuum-pipe, leading from the air-pump, and have a float resting in the mercury in the other leg from which a rod may proceed; connected with a lever, mounted upon the axis of a throttle-valve placed in the pipe, which brings the steam from the boiler to the engine, and thus, by regulating the supply of steam, retards or accelerates the motion of the steam-engine. Although the pit or shaft may be miles distant from the steam-engine, yet the float, X, in the water at the bottom of the pit, becomes the regulator of the motion of the steam-engine. In case of having to raise water from excavations, holds of ships or vessels, or where the depth is not so great as the atmospheric pressure, one lift will be found sufficient, and the air-pump may be frequently worked even by hand, or by the power of horses. To apply my said invention to give motion to certain machinery, such, for instance, as whimsies, for raising coals, or ores, or other substances from pits or shafts, and also for actuating stamping mills, crushing or grinding mills, cotton or woollen machinery, gunpowder mills, towing of canal boats, locomotive carriages on common and rail-roads, ploughs, thrashing machines, rolling-mills for metal, and other substances, paper-mills, turning and boring lathes, blowing-engines, and saw-mills, I cause the vacuum to act upon one or both sides of the pistons working in cylinders, after the manner of steam-engines, in the same manner as described in a patent formerly granted to me, for working cranes and tilt hammers, or forge-hammers, and which, therefore, need not be more particularly described here. I do not mean, or intend, hereby to claim, as my invention, any particular forms or arrangements of machinery, nor any of the parts herein shown and described, which may have already been used, but only in connexion in the manner herein shown and described. But I do hereby claim as my invention, the raising of water without its entering the working-barrels of pumps. I do not mean, or intend, hereby to confine or limit myself to the employment of any particular material or materials, in the construction of the different parts of the apparatus, but to employ any which are fit and proper for the purpose.—In witness whereof, &c.

Enrolled November 9, 1836.

[The general arrangements of this invention are very similar to an apparatus described in "Gregory's Mechanics," page 210, vol. ii., for raising water to a great height for irrigating land, in a situation having the advantage of a small fall of water. It is, in fact, Hero's fountain reversed. There is no doubt it would answer the purpose, and in some situations would be very valuable, where a central engine might drain several pits, situated in difficult situations, as the pipes might be carried through the workings of a mine, where pump rods could not be passed, excepting at great expense. Last, and not least, the air entering the boxes as the water is discharged, may be the foul air of the mine, and thus ventilation and draining may be carried on by one operation, and at an expense due only to the latter.]—EDITOR.

ARCHITECTURAL PRACTICE.

SIR,—A short time ago we were induced to purchase your journal at the solicitation of a friend, who recommended the work, as being the only medium for acquiring correct architectural information. It is unnecessary to state more, except, that after carefully examining several numbers, we were struck with the *fact*, that many important communications were passed unnoticed by the majority of your readers; for instance, in your number for *December* last, we find an article upon *Competition Estimates*, which is a subject of interest not only to the architect and builder, but also to the public at large. This letter, we believe, has never been commented upon, nor any *practical hints thrown out*, by your numerous correspondents. Under the impression, then, that the following *system* may be deemed worthy of consideration, or at all events call forth the talents of those who, from longer practical experience, are capable of *judging* of its working, we gladly take the opportunity of briefly stating our method of conducting contracts in Liverpool.

In the first place, we are careful that our *working drawings and details* are complete and perfect, so that it is unnecessary to furnish *more* during the execution of the building. We then print the specification, after which the whole matter is given into the hands of an acknowledged *measurer*, who takes out the *quantities* upon his *own* responsibility. We then *advertise* in the usual way, except that we inform the parties tendering, that printed copies of the quantities may be obtained from the surveyor, without any *charge*, in the first instance; but, should the builder be successful, he pays *one half* the fees of measuring, and the proprietors or committee the *other half*. This we find to save a considerable time in the first place; and, secondly, the printed *schedule* is filled up in *detail* by the contractor, with the prices of each *article per foot, lineal, superficial, &c. &c.* This list is deposited *with us*, and becomes the standard for all *extras* or *deductions*, and, we must say, is the best arbitrator we have yet met with. *Should* it happen that the proprietors make extensive alterations, we then employ the surveyor to measure the extras, and we ourselves fix the price from the *list* above-mentioned. It is proper to state, that we are not aware of this *plan* being adopted by any other member of the profession in this place; indeed, we are sorry to acknowledge, that in almost every instance the architect has the whole business of measuring, calculating, &c. This you will be aware is a most ruinous proceeding to all parties concerned, besides placing the architect in a *subordinate* situation, and without that independence of action which is so necessary in a professional man. We hope and trust, however, that in London you have a better state of things, or, in truth, your correspondent "*J. J.*" may affirm, that contract work is never so well done as it ought to be. We intend shortly to forward you a short account of some of our new buildings in this place, should you think it worth while. We remain, in great haste, yours, &c.

Liverpool, April, 1838. C. & H.

[Our correspondents' practice nearly agrees with that which is adopted by the architects in London, excepting that instead of one surveyor being appointed, there are two nominated, for the purpose of taking off the quantities; one by the architect, and the other by a majority of the builders who intend to send in tenders. The two surveyors take off the quantities together, and check each other as they proceed, in the dimensions, abstract, and bill of quantities. The successful party, whose tender is accepted, has to pay the surveyors their charges, which are generally added to the amount of tender by all parties alike, the surveyors previously informing them of the amount.

We feel obliged by our correspondents' offer, and shall be most happy to hear from them again.]—EDITOR.

DRY ROT IN TIMBER.

Extracts from the Fifth and Concluding Lecture on the Qualities of Timber, delivered before the Royal Institute of British Architects, by ROBERT DICKSON, M.D., F.L.S., *on Monday, March* 26, 1838. EARL DE GREY, President, in the Chair.

THE most effectual means of preserving timber from decay, is a subject of vast interest and importance to the engineer and architect. It will be admitted by all, whatever they may think of the probable success of Mr. Kyan's

mode of seasoning timber, and insuring it particularly against the ravages of dry-rot, that the operations of the Company engaged in working out his plan are affording us, on a grand scale, that experience which must be the ultimate test of the value of such an invention. It is not a short series of years that can convince the world of the complete success of his process, in eradicating an evil, which itself comes on silently and slowly. His earliest experiments are perhaps not sufficiently widely known to satisfy all; but now the operations are carried on so extensively, it is so generally known that various great public works are executing with timber prepared under his patent, that all have the means of judging for themselves of the efficacy of the plan. Time alone will show what is the value of the invention. In the meanwhile Mr. Kyan's method receives every encouragement in the countenance of the numerous eminent professional men and great public companies who are adopting the process; and the public may be greatly assisted in forming their judgment, and disabused of some prejudices on the subject, by the interesting and useful lecture from which we proceed to give extracts. Though one of a series, it is complete in itself; it has for its subject *the causes of decay in timber, and on the most effectual means of preventing it.*

"The utility of timber, when employed in the construction of edifices and other arts of life, is greatly lessened by its perishable nature. In all cases where wood is wished to be durable, it must be submitted to processes which have hitherto been tedious, and attended with the loss of capital, thus rendered inactive during the years which were required for their completion. These processes are termed seasoning and drying; which are accomplished either by the natural powers of the air, to take up and carry off superfluous moisture from any body which will readily part with it; or by immersing the timber in water, which dissolves out the mucous and other viscid soluble principles which have a tendency to retain much of the moisture, and thus permit the more speedy evaporation of the watery part, upon the removal of the timber to a dry atmosphere, where there is a free circulation of air, by which the process is expedited; or, to render it still more expeditious, recourse is had to boiling or steaming, the higher temperature rendering the solution of many of the principles more easy.

Of all these means, steaming appears to be that which facilitates the process to the greatest degree, 'the seasoning going on more rapidly after the piece is steamed than when boiled.'—*Barlow on the Strength of Timber*, p. 14. By all of them a loss of weight is occasioned. Steaming, or boiling, 'impairs the strength and elasticity of timber;' but Mr. Tredgold thinks 'it gives another property, which for some purposes is still more desirable than strength; for boiled or steamed timber shrinks less, and stands better than that which is naturally seasoned.'—*Carpentry*, p. 157. The most expeditious of these processes still requires months for its completion, and the wood is generally squared before even commencing them, by which a large quantity of timber is rendered useless for the purposes of construction.

The object of all of them is to counteract, or, more properly speaking, to postpone the operation of those causes of decay which are inherent in wood and all organized bodies. They effect this, however, in the majority of cases, in a very limited and inadequate degree; for still decay occurs, and succeeds in reducing these structures to dust and ashes. Decay may occur while the tree is yet standing, and is indicated by the death of the main-top, which is generally the result of the infiltration of water into the interior of the tree, by natural cracks or accidental openings, which gradually affects the internal part of the wood, and occasions its decomposition. This extends from the heart outwards; the external or young parts resisting for a longer time—and hence those shells of ancient trees which we frequently meet with. The progress of this kind of decay undoubtedly continues after the tree is cut down, and even fashioned, and applied to use: the order of march, however, is still the same; the layers, or circles, successively becoming decomposed, according as they are near the centre. The whole process is slow in its operation, often requiring forty or fifty years to destroy a beam of moderate dimensions:—though this kind of decay is important, it is not necessary to speak further of it, as there exists so simple and effectual a remedy, viz., cutting down the tree before it shall have passed its zenith.

The other kinds of decay to which timber is liable, are termed the common rot and the dry-rot. 'The former,' Sir John Barrow considers 'to be occasioned by alternate exposure to the vicissitudes of the weather—to moisture and dryness, and to heat and cold—hence, frequent at the point where a pile is between wind and water, or where a beam enters a wall: in the latter case, the progress is from without inwards.'—*Supplement to Ency. Brit.*, Dry Rot. As the causes here are extrinsic, protecting the wood against them is often sufficient; for this purpose, painting, coating with tar, &c., are had recourse to.

Widely different is the case with the dry-rot, the causes of which are inherent in the timber, and only require the concurrence of a few external conditions to come into action. It has been, with propriety, proposed to designate this malady sap-rot, since the elements of it chiefly abound in the outer layers of wood, and, when its direful action has begun, proceeding from the more external to the internal layers, the entire structure, however, soon becoming involved. The reasons of its commencing in the sap-wood are to be found in an attentive consideration of the nature of that part of the vegetable fabric."

Dr. Dickson next proceeded to describe the growth of timber, its constituent parts, and the cause of their decay by fermentation.

"The sap-wood is the part in which the decomposing operations commence; and hence the propriety of the term sap-rot. With regard to the share which each of the destructive agents has in the whole series of actions, it is enough to state that the fermentation excited by the albumen is the primary and essential, the agency of insects and fungi being only accessory. Insects attack vegetable structures, both living and dead, chiefly for the saccharine or mucilaginous principles which they contain, and aggravate the evil, principally by hollowing out the substance, and permitting the access of air and moisture; but the part performed by fungi is more obscure, and hence numerous erroneous notions exist respecting them. Some have thought that they were examples of equivocal generation—an opinion which receives no countenance from any one who has carefully studied their nature, or the mode of their production. The minuteness of their reproductive matter allows them to escape observation when scattered; but this is always prepared in definite and fixed parts of the structure of those already existing, as much so as that of the seed of a rose or of an apple; but their number surpasses that probably of any other vegetables,—while their sporidia, or reproductive particles, can retain the power of vegetating as long probably as any seeds.

The albumen of the wood must be in a fluid state, or capable of becoming so, before it can enter the tissues of the fungi; for they cannot, any more than other vegetables, by their roots, take up even the proper materials of their food, unless it be in a state of solution. The germs of the fungi are roused into activity by the heat accompanying the fermentation of the albumen, and other fermentable principles, just as mushroom spawn is developed by the fermentation of the dung, &c., of a mushroom bed.

The abundance of fungi in autumn, while the earth and air are still warm and much vegetable matter is going to decay, shows how far heat aids in their development.

It appears, therefore, that the whole theory of any successful plan for the prevention of the dry-rot must resolve itself into the *solidifying or coagulation* of albumen. This will at once prevent the commencement of the fermentation, which decomposes the original structures of the wood, and the development of fungi; which are neither the cause of dry-rot, as held by some, nor the effect, according to others, but the incidental accompaniment, when their germs happen to be present in the tissues of the wood.

Now, this is precisely what is effected by the method of Mr. Kyan, and it matters not whether he invented it or merely extended a plan in use before or suggested by others; for, though it was suggested, both by Sir Humphry Davy and Mr. Chapman, before he brought his publicly forward, yet he who by his energy and perseverance brings the method into use, deserves to be regarded as the inventor."

The lecturer then described the method adopted by the ancient Egyptians for the preservation from decay of the dead bodies of their deceased friends. The agent employed by them has been discovered to be *creosote*, which is now extensively employed for the preservation of animal structures for anatomical purposes, as it coagulates the albumen. Anatomists have long employed corrosive sublimate to preserve their preparations, even the most putrescible.

"The collateral evidence of the utility of coagulating albumen, as a means of ensuring the preservation of the substance, seems ample enough.

We must now inquire how far this method confers durability upon timber for practical purposes. We know the extremely long period which some timber will last; but we also know how liable much of it is to decay; and, as no one can be sure that any given piece of timber which he intends to use possesses the qualities requisite for durability, it seems desirable to have recourse to some means which will confer an equal degree of durability upon all the timber employed in the construction of an edifice. We are, I think, warranted in anticipating that such will be the result of Mr. Kyan's plan; which effects the solidification of the albumen, more particularly of the sap-wood; thus preventing it being liable to fermentation, or capable of being dissolved to furnish a pabulum to fungi.

As the depth to which Kyan's solution penetrates has been made the subject of careful investigation, by Professor Faraday and others, I refer, on this head, to their evidence; and rather touch upon some other points."

It appears from experiments which have been made to ascertain the comparative strength of wood prepared by Mr. Kyan's process, and unprepared wood, that the preparation makes no change in its strength.

Dr. Dickson made some remarks, to show that the small quantity of mercury contained in the wood was not injurious to the health of the inhabitants of houses, or ships constructed with prepared timber.

"Holding the question of the preventive power of Kyan's plan to be settled in the affirmative, as far as the dry-rot, in the strictest sense of the term, is concerned, it may be proper to adduce some proof of its preservative effects against insects and fungi. Mr. Curtis, the distinguished author of the 'British Entomology,' has informed me, that since *palings of prepared wood* have been used in the Regent's-park, he can no longer find those insects which formerly abounded there. Farther, the Rev. Miles Berkeley, author of that part of 'Smith's English Flora' which treats of fungi, and who publishes 'Fasciculi of Dried Fungi,' in illustration of that volume, having been annoyed by a fungus called Thelephora puteana springing up in a cupboard, which it rendered constantly damp, he applied a solution of corrosive sublimate to the woodwork; and so effectual did the application prove, that he cannot now procure a single specimen of that fungus, though it would be invaluable to him for the completion of his work.

Having the evidence of so many different individuals in favour of this plan, none of whom have any pecuniary interest in its being adopted, we must either question their competency to judge of its merits, or admit its validity; since we may well ask—

'Or how, or why
'Should all conspire to cheat us with a lie?'"

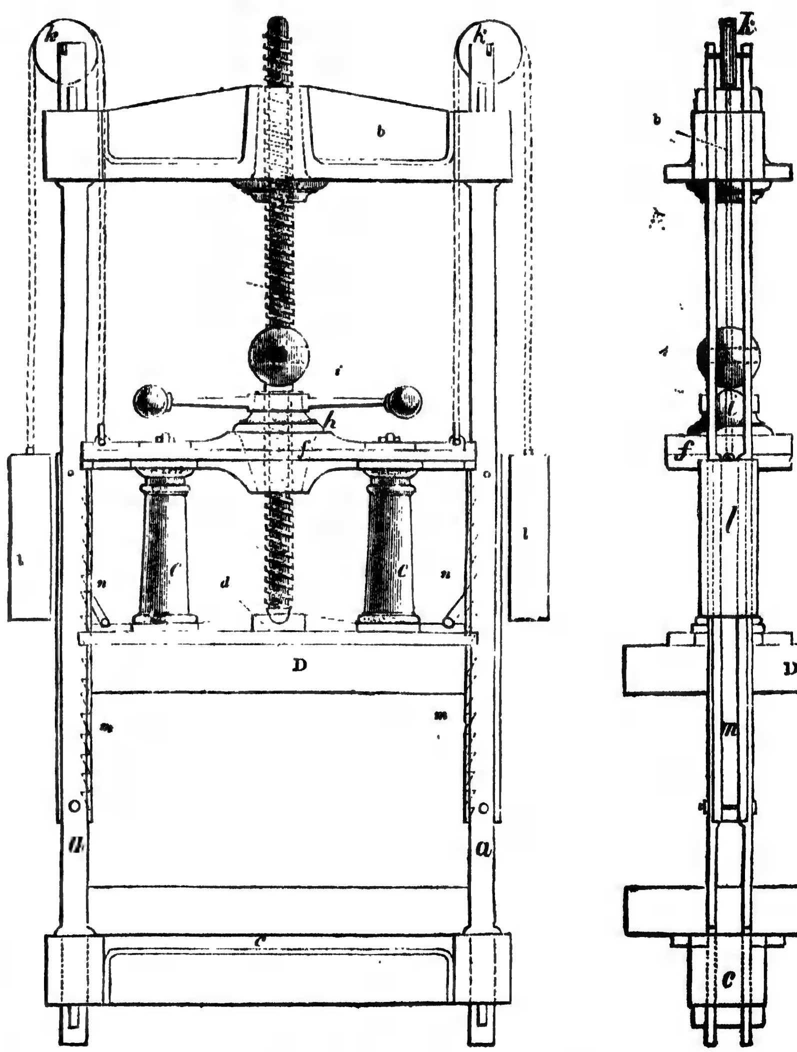
The lecturer concluded by reading the following certificate from Mr. Beazley, the architect:—

"March 24th, 1838.

"Sir,—At the commencement of the year 1836, I surveyed and accurately examined the posts and paling in the Regent's Park, for the purpose of ascertaining the comparative states of those timbers which had been prepared by Kyan's Patent and those which had not been submitted to the process of solution. In my report of that period, I stated that indications of decay were already perceptible in most of the unprepared timbers, both at the bottom of the posts, and in those arris edges and ends of paling which were placed in or had come at all in contact with the earth, while those timbers which were marked as having passed through the solution were quite free from any such symptoms. I now beg leave to state that I have this day, after a lapse of two years and a quarter from my previous survey, agaain ccurately examined several of the same posts and paling, digging away the earth from the foundations for that purpose; and find that the symptoms of decay, mentioned in my preceding report as having commenced in the unprepared timber, have so considerably increased, as to have rendered the bottom of the posts completely rotten, to a depth of from one to two inches, and that, in several instances, fungi have been the consequences of the decay; while I find the prepared timbers which are in the earth sound and in the same state, with the exception of mere discolouration upon the surface, probably arising from the damp state of the earth at the time of its removal. As a farther proof of the difference existing between the unprepared and the prepared timber, we could cut, with the greatest ease, large pieces from the former with the spade, without using any force, while it required great exertion to chip off very small pieces from the latter. I have the honour to be, &c.

To Wm. Morgan, Esq. SAMUEL BEAZLEY, Architect."

CURTIS'S SCREW PRESS.



The important character of this press is, that in the first instance it compresses the goods subject to its actionin a rapid manner, and afterwards by a slower and more intense pressure. In the common screw, an intense power can only be obtained by either a very fine screw, or a very long lever; but in this case a power, however great, can be obtained by a screw, however coarse, and a lever, however short; it is only necessary that then, to procure an infinitely high power, the difference between the two threads of the screw should be infinitely small, although the pitch of the screws may be individually, however, coarse.

The principle upon which the screw acts is similar to Hunter's screw, described in most elementary books on mechanics; but for all practical purposes that screw is useless, and totally different to mine. It will be seen, upon reference to the plate, that the screw is double: the upper part, working in the head of the press *b*, is, for example, three quarters of an inch pitch; and the lower part, working in the loose nut *h*, is five-eighths of an inch; the difference therefore is one-eighth of an inch; so that when the screws work in concert, it is equivalent to a single screw of one-eighth pitch.

The mode of operation is as follows: When the goods are placed in the press, the screw is brought down, and the toe of the screw enters the step *d*, fixed upon the follower D; it then acts by the upper screw alone, and is the same in this case as any other screw press; but when the goods are compressed as far as the power of the workman can by this screw compress them, the palls *n n*, connected with the upper part of the follower *f*, are thrown into the ratchet sides *m m*, fixed in the sides *a a* of the press; these ratchets hold down the follower, whilst the screw is screwed back as far as it can be towards the head of the press *b*, then the moveable nut *h* is brought down upon the head *f* of the follower, and the screw again screwed down upon the goods; but now the two screws act together, and the space through which the follower moves is one-eighth of an inch at each revolution of the screw. When the screw has reached the step *d*, the palls are again thrown into the ratchets, and the screw drawn back as before, so that by this means the follower can be advanced a distance by the higher power of the screws equal to the screws' length; *c*, is the base of the press; *e*, the columns supporting the head of the follower; *i*, the handle and balls, connected with the loose box *h*; *k*, wheels, over which pass the chains connecting the counter-balance weights *l l*, with the follower D. A press of 100 tons' power may be seen at Messrs. Rennies; it has been proved in various ways; and from the circumstance of its extreme simplicity, and not *giving* under the pressure, is, in every sense of the word, superior to the hydraulic press. For the purposes of the manufacturer, it is decidedly to be preferred; its cost is less than the hydraulic press, and it is liable to no accidents; and for the colonies, and the packing of cotton, &c., its use will be invaluable.

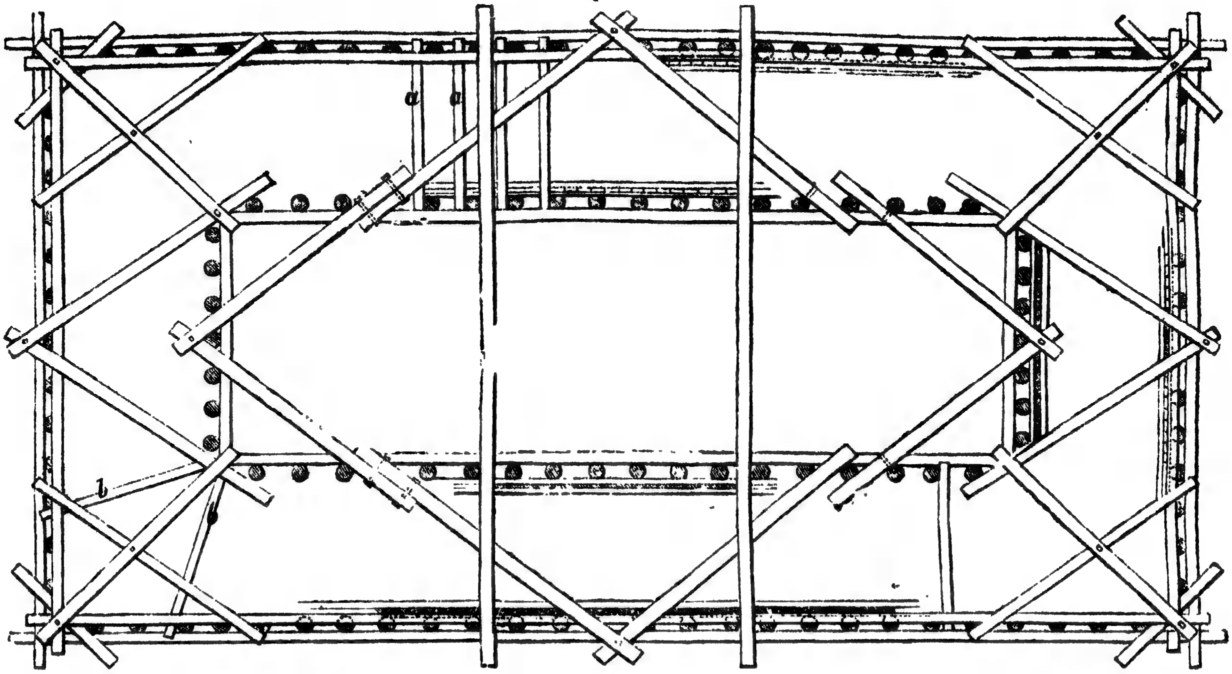
W. J. CURTIS.

1, *Stafford Street, Bond Street.*

POTOMAC AQUEDUCT.

(Continued from page 160.)

Fig. 6.



Coffer Dam, Pier No. 1.

June 14th, the oak piles of dam No. 2, being all driven, preparations were made for building one for the pier (No. 1.) next the Virginia shore, upon the site that had been occupied by the circular coffer-dam of Messrs. Martineau and Stewart; this dam was upon the same plan as that of the dam for pier No. 2.

It would have been well if we could have waited to profit by the experience to be gained in employing No. 2, but it was then believed that two piers might be built within the year, and we had to proceed with both. Our experience, however, had taught us to guard more effectually than heretofore, against the expansion of the clay puddling, which tended to force the outer and inner rows of piles apart. Ties were therefore placed at every oak pile, and they were notched on to the string pieces, and were rag-bolted to the stringers and oak piles.

Large timbers (14 inches square) were laid from the centre of the outer row of the sides of the dam, crossing the corners to the centre of the outer row of each end, and they were notched on, and bolted to every timber they crossed; these ends, too, were made to cross, and were halved into each other, and were secured by a bolt. Two long tie pieces were then placed entirely across the dam, dividing it into three equal parts, and notched and well secured.

The up-stream ends of this dam were left square, great difficulty having been experienced in cutting off the corners of the other dam, and the angles were secured by a second set of stringers placed upon the tie pieces of the outer and inner rows of piles, and bolted to the oak piles, they passed and were halved into each other at the corners of the dam; these stringers were continued entirely around the dam, and a piece was also placed at each corner, to connect the exterior and interior pile of the angles, as in figure 6.

Pumping and Excavating Coffer Dam No. 2.

The puddling of dam No. 2 was then brought up to a level with the tie pieces, and two pumps were placed in the down stream end of it, they were octagonal shaped, and were shortened to conform to the then depth of water, and were placed in the dam for experiment; they were found, however, to be quite sufficient to discharge the water as low down as the original surface of the mud.

On the 2nd of September a trial was made of the pumps, which did not prove to be very satisfactory, owing to the stretching of the ropes and the breaking of the straps, &c. &c. (leather straps being first used for the buckets, for which chains were ultimately substituted). On the 3rd of September another trial of the pumps was made, more successful than the first, although the machinery still worked imperfectly.

The pumps were worked by ropes passing over grooved sheaves eighteen inches in diameter, attached to a drum four feet in diameter, on the steam-engine; the drum, by a reciprocating motion, caused one bucket to rise while the other descended. The length of the stroke of each pump was six feet, and the engine, at first, made twelve strokes per minute, and lowered the water in the dam at the rate of two feet per hour. The speed of the engine was then increased to fifteen strokes per minute, and was continued at that speed for one and a half hours, in which time the water was lowered one foot ten inches more.

The dam being now in some danger from the pressure from without, the pumping was discontinued, and additional shores were placed against the stringers, and preparations were made for placing a second tier of shores eight feet below high-water mark.

On the 6th, after some further alterations, and the ropes being well stretched, another trial of the pumps was made, and in fifty-six minutes time the water was lowered three feet, but still the discharge was only 4.1 cubic feet per stroke of six feet, while the capacity of such a stroke was in fact 8.2 cubic feet, a diminution of one-half, being attributable to the leakage of the pumps, and the imperfect working of the buckets. On the 8th of the month, the second tier of shores being prepared, the water was lowered two feet in one hour and eight minutes, so as to admit of their being placed, and they were placed on that day, the carpenters working until ten o'clock at night.

On the 9th, the water was lowered two feet six inches in forty minutes, and it being now nine feet six inches below the high-water level, the weight of the puddling was such as to cause the sheet-piles to spring inwards, short pieces of timber were therefore wedged in between the oak and sheet-piles, extending from oak pile to oak pile to support the sheeting.

On the 10th, the water was reduced in depth two feet in forty-five minutes, and on the 11th, four feet in fifty minutes, the pumps discharging 6.87 cubic feet per stroke, working at fourteen strokes per minute; the leakage of the dam at this time was observed to be one inch per hour.

So frequently were accidents happening to the machinery and pump gearing, that the time of pumping in each day rarely exceeded the time above noted.

The dam being now entirely emptied of water, a third tier of shores were placed this day at the surface of the mud.

The excavating machine was put into the dam. This machine consisted of an endless chain of buckets, working vertically over and under square drums of cast-iron, fixed at top and bottom in a frame of four upright pieces of timber forty-five feet long, this frame was suspended on a moveable axis, resting upon a carriage which was moveable on a railway crosswise of the dam; and this railway was upon a carriage likewise moveable upon a railway lengthwise of the dam; the breadth of the sides of the square drums corresponded with the length of the links of the chain. See figs. 1 and 2, p. 147.

Upon the axle of the upper drum, a cam and near it an open box or hod was fixed (see figure 10) to receive from the buckets, and discharge into an inclined trough, the matter brought up by the machine. See fig. 2, p. 147.

This contrivance worked well, and preserved a constant communication between the buckets and the scows which were stationed under the lower end of the trough and along side of the dam.

The excavating apparatus was worked by an endless rope passing around a drum on the steam-engine scow, a bevel gear (fixed upon the carriage which moved lengthwise of the dam) changed the direction of motion by another endless rope passing around a drum upon the machine itself.

This machine being in readiness, a trial was made of it on the 2nd of Oct., which was not very successful, for it was found to be a very difficult matter to give to the endless chain its proper degree of tension; it broke on the first trial from the great resistance it met with in dredging.

On the 3d and 4th it was tried again, but it still worked indifferently, and it was found to be extremely difficult to be moved upon the railways, owing to its very great weight, and especially when it became clogged with mud.

To move it from space to space between the shores, where only it could operate, it was necessary to lift it over the shores, and this was attended with very great delay.

The intention of using it as an excavator was therefore abandoned, and it was fixed within a few feet of the pumps, and used as an elevator, labourers with shovels being stationed in the dam to fill its buckets. As an elevator it proved to be useful, although it was yet not without its inconvenience, the men were sometimes unwilling to work under it, as they often were exposed to the falling mud and water.

In addition to this machine, a windlass was erected across the dam near its upper end; it was also worked by the steam engine, and was capable of raising four buckets at once, each containing 4.6 cubic feet. The horse pile drivers were stationed at the centre of the dam, and were also used for hoisting out mud. See figures 1 and 2, p. 147.

By these means six feet depth of mud was removed by the 22nd of October, notwithstanding the frequent interruptions from the machinery getting out of order.

At this period it was discovered that several oak piles on the south side of the dam were broken, and that the great pressure had caused the braces at the end to crack; this created great alarm among the labourers below. Immediate steps were taken to secure the work by doubling the number of shores at the original surface of the mud, and by placing another tier (4th) at its then surface; but before this could be fully accomplished, viz., on the 30th, a leak occurred in the north-east corner of the dam, which soon filled it. This leak was caused by the great weight of the column of water on the outside forcing the mud from beneath the puddling into the dam under the foot of the "montant" piles, which, as before remarked, were not driven to the rock. The puddling soon after settled down and stopped the leak, and the vacancy at top was filled up.

The following day the pumps were at work again, and had lowered the water eight feet, when the crank wheel of the engine broke, principally, no doubt, owing to the smallness (18 diam.) of the sheaves over which the pump ropes moved, too great a strain being thus brought upon it; these sheaves were taken out, and others of three feet diameter were substituted. The crank wheel was replaced by a new one, November 1st, and on the 2nd all the water was pumped out of the dam, and the carpenters resumed the business of shoring.

The dam was not now so tight as it had been heretofore; several small streams of water came in around the down-stream end, notwithstanding which, one pump was found to be sufficient to keep down the leakage, and enabled the carpenters to work with comfort.

During the night of the 3rd, while the pumps were at work, a large leak opened at the south-east corner, from the cause heretofore mentioned, and filled the dam, no workmen being in it at the time; the leak was not discovered soon enough to stop the pumping before the sand had accumulated above the heel of the pumps. The increased strain thus brought upon the pump ropes, broke the crank shaft, and this derangement of the engine caused the breaking of the flange of the fly-wheel. On discovering the condition of the work, the pumps were hoisted out of the dam and cleared of sand; the repairs of the engine were immediately commenced, and an alteration was made in the pumps by cutting holes in them for the discharge of the water a few inches above the level of the dam; heretofore it had been discharged at their full height.

On the 5th the pumping was again resumed, and 17 feet 4 inches depth of water was discharged by two pumps in 4 hours 32 minutes working time, or at the rate of 3 feet 10 inches per hour.

The puddling which had settled down five feet was replaced, and this increased weight of clay caused the stringers of the outer row of piles to break, and the wall of the dam of course to spread a little.

It was now that the long ties, heretofore described as extending entirely across the dam, were put in.

The weather having by this time become very cold, and indicating an early winter, it was thought prudent to make preparations for protecting the dams against the floating ice which the freshets might carry against them. Accordingly an ice breaker was commenced a short distance in advance of each of the dams.

Although the intention of emptying dam No. 2, and commencing the masonry, if possible, this year, was by no means abandoned; on the contrary it was resolved to prosecute the work night and day, and on the 8th the excavation was resumed; some delay was caused, however, by the last incursion of sand which had accumulated about the pumps, so that the water could not be entirely pumped out, and it had also buried up the lower buckets of the mud machine; these were soon relieved, however, and the machine was actively at work until the afternoon of the 10th, when the crank shaft of the engine working the pumps was again broken; the other engine working the mud machine was kept at work raising water only, and it was found sufficient to keep the leakage under, so that the carpenters could work below.

The crank shaft of the broken engine was replaced that night, and a gang of labourers were employed also during the night in removing the sand from around the pumps. On the 11th the pumps were lowered, and the dam was entirely drained of water. The windlasses for raising mud at the upper end of the dam were again put, and continued in active operation, although frequent interruptions were caused by the breaking of the pump ropes.

As the height to which the water had to be raised increased, these ropes were found to be too weak, and their size was increased to six inches.

At this time, W. M. C. Fairfax, Esq., the engineer of the Alexandria Canal Company, who had been heretofore associated with me on the work, acquainted me with his intention to retire from the service of the company; a resolution which I learned with much regret, as he was a well-informed and very efficient engineer, and our intercourse had been always characterized by much harmony of opinion and feeling.

The excavation went on very actively and without interruption until the 15th, when the leak sprang again in the south-east corner; the water rushed in very copiously till it reached the lower tier of shores, when the puddling on the south side settled down two feet below the tie pieces, for two-thirds of the whole length of the dam, and the leak then diminished.

The weather being at this time very stormy and cold, the labourers were very reluctant to work, and, in the afternoon, one-third of their number refused to return to it; those who did, were employed in replacing the puddling; but that night not a labourer could be induced to turn out.

The superintendents, carpenters, and blacksmiths, were therefore sent on the dam to hoist the pumps out of the sand, and at midnight one pump was at work.

The next morning, there being no abatement of the storm, the labourers still refused to work, and the mechanics were again sent in their stead to raise the other pump, and this was done during the day, and the dam was then drained as low as the last incursion of sand would permit.

One pump, which was sufficient to keep down the water, was kept at work during the night, in the hope that the weather on the ensuing morning would be more favourable; but the storm still continued, and snow having fallen previous to the rain, there could be no doubt but that there would soon be a freshet in the river. It was therefore thought prudent to secure every thing about the work, and as labourers could not be procured for that purpose, the mechanics again cheerfully undertook this duty also. The current already in the river being too strong to attempt the removal of the steam scows, scope was given to their fastenings, and they were allowed to swing under the lee of the dams.

The pile driver scows, the large crane scow, and some of the smaller scows, were moored under the lee of the causeway of the aqueduct; but after six hours' exposure to a pelting rain, which froze as it fell, and in the night too, we were forced to return to the shore, and leave the others to take their chance, secured to the dams as well as they then could be.

During the night, several of the scows were swept from their moorings and driven ashore, and, as had been foreseen, the freshet rose over the sunken puddling, and filled the dam.

Nov. 18th. The weather cleared off, but the labourers did not return to work at the usual hour; but during the day, a small force was raised and set to work to get off the scows that had been driven ashore. On the 19th, this force was increased, and employed in boating clay to replace the puddling which had sunk in the dam.

On the 20th, a large force of labourers was raised, and employed in boating clay; and at noon the repuddling was completed, and the pumps were in readiness for work.

The dam was pumped out during the night; but on the morning of the 21st, the leak in the north-east corner opened again, and spouted copiously for a few minutes; the puddling then settled one foot, and the leak ceased. The weight of the puddling on the south side caused the dam to spread a little more, and additional long ties were therefore placed across it.

The pumping was continued during the night of the 21st, until the segment wheel of the pump gearing broke; but it was soon replaced by the one from the other engine, and the pumping continued.

In the afternoon of the 22nd, the leak in the north-east corner increased, the dam filled, and the puddling settled* two feet.

I had been much disheartened by these frequent leaks and incursions of sand; but it had now become very apparent that the whole mass of mud and sand underneath the puddling would be washed into the dam, and that, on its being replaced by the clay puddling, the dam would become tight.

But notwithstanding this conviction, it was not very pleasant to recollect that the other dam (No. 1) was constructed upon precisely the same plan as this, and that consequently the same difficulties might be reasonably anticipated with respect to it. But I now felt quite convinced, that by perseverance all difficulties could be overcome, and the ultimate success of the work ensured. I was very much encouraged also by the confidence of the president and directors, and their advice to persevere.

Sunday, November 23rd, was very boisterous, and it was with great difficulty that clay could be boated to the dam, especially with so small a force as could be induced to attend; one pump was at work, and at four o'clock in the afternoon, the water was down to the lower tier of shores, when the crank shaft of the engine broke; during the night it was so stormy that it was impossible to keep lights to hang the crank wheel upon another shaft.

These frequent *fractures* of the machinery were attributed, and I think with reason, to the intensity of the frost.

On the 24th, the water in the dam had risen but twenty-two inches in fifteen

* At sunset the pumps were at work again, and the water was lowered very rapidly; but during the night, the dam again filled, and another settlement of the puddling took place.

hours, during which time the pumping had been suspended, the crank shaft was replaced, and the pumping was resumed, but the weather was so boisterous and cold that the labourers could not be persuaded to go into the dam. On the 25th, in the afternoon, four men were persuaded by the offer of high wages to go below and clear the sand from around the pumps, but working at night was entirely suspended, by the difficulty of procuring labourers.

On the 26th, the labouring force was increased to eight men, who were employed clearing away the sand from the pumps and in throwing it to a convenient place, to be raised by the machine. The force was increased gradually, and the excavation now progressed very well. On the 3rd of December, the rock beneath the mud was touched by one of the shovellers about the centre of the dam; at dark, when the labourers left off work, the dam was perfectly dry, it was examined all round and no appearance of a leak was discovered. At nine o'clock a noise was heard, of which no notice was taken by those who attended the steam-engines and pumps, but at one o'clock in the morning, the superintendent of pumping discovered that the dam was full of water, a leak having opened in the up-stream end, and that the puddling had settled down five feet. The next morning the whole force was employed in boating clay to renew the puddling, and the pumps were tried, but without effect; the tide ebbed and flowed in the dam. At two o'clock, P. M., the puddling was raised nearly to the tie pieces, and the pumps were tried again with better success than in the morning. The water was lowered six feet four inches in one hour and forty-five minutes; the pumping was continued during the night, and on the 5th, the dam was entirely free of water, and the windlasses at work hoisting out mud; this last incursion of sand and mud was comparatively small, it was all removed at noon; but whilst the labourers were at dinner, the leak opened again, and the dam filled; the puddling settled below the tie pieces, but it did not stop the leak; the pumps were tried at intervals throughout the night, but without effect, and the tide continued to ebb and flow in the dam until the 8th, when the puddling at length settled down, and the water was pumped out.

On the 9th, soundings were taken to determine the quantity of mud yet to be removed, and it was found to be 350 cubic yards, the surface of the rock very uneven.

The excavation progressed very well until noon the next day, when several leaks occurred at once on the south side, and the dam filled. On the 11th the puddling, which had sunk, was replaced, and the dam pumped out again.

The excavation was resumed, and all the sand that had been washed in under the "montant" piles was removed.

It was ascertained that this last incursion of sand came from the outside of the dam, as well as from underneath the puddling, and that the outer row of piles had settled down five inches, whence it plainly appears, that the outer as well as the inner row of piles ought to be driven to the rock.

The dam was now tight, and the excavation continued until the 19th, with occasional interruptions from the breaking of the machinery, which we attributed to the frost. On the 14th, the puddling on the south side settled three feet, but this caused no interruption to the work.

On the 15th, the river was covered with ice, the water in the supply-pipe of the engine was frozen, and the flanges of the steam-pipe broke. These were soon repaired, and, in the afternoon, the windlasses were at work. On the 17th, a large force was employed at the excavation, and both the machines and the windlasses were at work until noon, when the loss of steam occasioned by the break in the steam-pipe rendered the engine incapable of working, and the excavation was consequently suspended. While the engine was being repaired, another set of shores was put into the dam.

On the 19th, the repairs to the steam-engine were completed, and the windlasses at work; the rock, for several feet at the upper end of the dam, was entirely laid bare.

A small leak was observed on the south side, near the upper end, but it soon ceased. Orders were now given for a boat load of stone to be brought alongside of the dam, and other preparations to be made for commencing the masonry the next day. A small force of labourers were persuaded to remain through the night to wash off the rock, and have everything in readiness for the masons in the morning. But at 11 o'clock, the leak which had threatened us in the morning, burst in with great violence, and the dam was filled with water in twenty minutes' time; the puddling then sank down four feet.

On the 20th of December, the whole of the force was employed in boating clay to replace the puddling; the pumps were also tried, but without effect.

At 2 o'clock, P. M., the puddling was raised sufficiently high to keep out the tide. At ebb-tide the water remained at a higher level in the dam than in the river, consequently the leak was stopped.

The pumps were now started again, and at the expiration of one hour, the water was lowered 2 feet 11½ inches, and the pumping was ordered to be continued during the night; but at 10 o'clock the connecting-rod of the engine broke, and caused some delay.

On Sunday, December 21st, the water in the dam was lower than the lower tier of shores; but the segment wheel of the pump gearing breaking, and another leak having sprung on the north side, the dam filled again.

It had been in contemplation, and arrangements had been making for some time past, to alter the mode of pumping, by taking out the drums, and substituting a crank motion.

All the fixtures for this purpose being in readiness, that alteration was now made.

December 22nd, the puddling was replaced, and the tide shut out at low water, and the tide did not rise in the dam. But the alterations of the engine, and the consequent changes in the sheaves for the pump ropes were not completed until midnight of the 23rd, at which time the pumps were put in motion. The new crank worked very well, but the pumps were soon choked with sand, and it became necessary to hoist one of them out.

On the 24th, the pumps were at work again, but the weights attached to one of the buckets broke off.

The other was kept at work, and the water was lowered rapidly, showing the dam to be tight.

On the 25th the dam was entirely free of water, and the excavation with the windlasses was resumed, and the carpenters were employed in placing another tier of shores near the surface of the rock.

The weather being very stormy (December 29th, seventeen inches of snow fell), but a small force of labourers could be kept at work, and they were employed in assisting the carpenters with the shoring.

January 1, 1835, the weather having moderated, the mud machine was set to work again, and we were enabled to lower down the pumps so as to drain the upper end of the dam to the bottom, and clear off the mud.

January 2nd, the men who were excavating around the foot of the pumps touched the rock with their shovels.

The dam being now in very fine condition, preparations were again made for commencing the masonry, and on the 3rd the mud was entirely washed off the rock for one-half of the length of the dam; the surface of the rock was seen to be extremely irregular, as if it had been worn into deep cavities; on this day, also, the masonry was commenced.

The pumps were lowered so far as to rest upon the rock; the mud machine, too, was lowered to its utmost extent, but was found to be too short to reach the bottom, being over a deep cavity in the rock; there remained in the dam, however, but a very small quantity of mud in the cavities of the rock; it was determined to remove the machine, and that the windlasses should take its place.

About fifteen cubic yards of masonry were laid this day in hydraulic cement, and the pumps were not worked during the night, that the masonry might be covered with water, although there was no apprehension of its being affected by frost at so great a depth. The night proved to be extremely cold, and on Sunday, January 4th, the river was covered with ice sufficiently strong to bear a man.

Being thus cut off from a supply of stone, a stop was put to the masonry and all our other operations.

Every effort was now directed to the removal of the machinery, and to placing it in a state of security. The steam scows, pile drivers, mud scows, &c., were removed, and they were drawn upon the flats under the causeway of Analostan Island, and under the lee of the causeway of the aqueduct. The pumps, mud machine, and windlasses were taken on shore.

The dam, No. 2, was covered with sheet plates treenailed to the ties and shores, with an inclination down stream to facilitate the passage of the ice over, and to prevent its falling into the dam, should the freshets rise to that height.

The puddling of dam No. 1, was brought up to the level of high water mark, and the ties, shores, &c., secured.

The ice breakers to both dams were completed. This being done, the campaign of 1834 closed.

1835.—Although the winter had been extremely rigorous, and a great quantity of ice had formed in the river, it passed off without the slightest injury to the coffer-dams, which were therefore in good condition for recommencing the work early in the season.

The campaign, however, did not open until the latter end of April; Congress having declined further aid to the work, funds were raised by individual enterprise.

The citizens of Alexandria, with their usual public spirit, subscribed the amount required by the engineer for the operations of the year, and on the 21st of April, the board of directors ordered the work to be resumed.

On the 22nd of April, a small force of carpenters and labourers were engaged in stripping dam No. 2 of its winter covering. The pumps were put in place, the steam engines were brought back to their positions at the dam, and windlasses were erected for hoisting out the small quantity of mud remaining in the dam. The railways were laid, and a double derrick, for hoisting in large stone, was placed upon them. See figures 1 and 2, p. 147.

These arrangements being completed, the pumping was recommenced on the 14th of May, and the dam was entirely freed of water to the rock in ten and a half hours, with only two pumps, and it was found to be perfectly tight.

It is worthy of remark, as a proof of the tightness of the dam, that for a space of nearly four months, the water inside did not reach the level of high-water mark by twenty-two inches.

Foundations.

On the 15th the windlasses were at work hoisting out mud, and the masonry was begun. The stone laid in the winter was found to be very solidly united, the cement having a most excellent set. To insure the safety of the dam, the masonry was now extended to the oak piles, so as to cover the entire space within, excepting a few feet at the down-stream end, where the pumps were placed.

On the 17th the mud was all removed, and the rock entirely bare. The windlasses were now removed, and the railway extended to receive another double derrick.

The railways were constructed thus: twelve-inch square timbers, of heart pine, were placed parallel to each other over the heads of the inner row of oak piles, and firmly secured to them lengthwise of the dam; flat iron rails were placed on the inner edges of the timbers, and upon these were placed two carriages of timber. One end of each carriage projected ten feet beyond the dam

over the scows ladened with stone, these ends were stiffened with braces of iron; iron rails, the profile of which was a semi-circle, were laid upon the carriage, and upon these the double derricks, which moved on grooved wheels fixed under each foot. Level with the base of the pyramid or derrick, a platform was extended, upon which the winch for hoisting was placed. The derricks were each worked by four men and a boy; the men at the cranks and the boy at the slack of the rope to take it up as it wound upon the drum. Stones, weighing from three to four tons, were by these means hoisted up and lowered into the dam with great ease.

I am indebted to Lieutenant Bartlett, of the Corps of Engineers, for the plan of the wheels on these derricks.

The maximum number of masons capable of working to advantage was now employed, and their confidence in the strength of the dam was such, that they worked without the slightest apprehension of danger, and the pier rose rapidly under their efforts.

A spectacle so unusual as that of men busily at work so far below the surface of the river, seemed to interest the public exceedingly; but to the engineer, whatever might be his confidence in the ability of the dam to resist the immense weight, which he knew to be constantly pressing upon it in the most insidious form, the sight was one which filled him with anxiety, and urged him to the most unceasing watchfulness.

The masonry was carried up perpendicularly until it reached the second tier of shores from the bottom, where it was made to assume the shape and dimensions originally designed for the pier.

It being considered too hazardous to take out the lower tier of shores, they were built in with the masonry, but as the masonry reached successively the shores above, the sides of the dam were braced against the wall, and the shores taken out.

The greatest pains were bestowed in tempering the cement, and ascertaining the proper proportion of sand; care was taken also in selecting stone of good quality and of large size; none were admitted whose beds did not exceed the faces at least four to six times, not only on the face of the work but entirely through it. No small stone were used, except to fill up the spaces formed by the irregular shapes of the larger ones; and the whole was well bedded in cement, no grouting was permitted. Cement was used to the height of two feet above high-water mark, and above that common lime mortar; the whole was pointed with cement.

The ice breaker at the head of the pier is of cut sienitic granite, from Sandy Bay, Massachusetts. The two lower courses, commencing five feet below high-water mark, were twenty two inches thick, and the remainder ten feet above high-water mark, were eighteen inches thick, no stone being of less size than twenty cubic feet, and the whole was laid in cement.

On the 21st of June, the masonry was on a level with the top of the dam. The derricks, railways, &c., were then removed, and two booms were substituted for them, to raise the masonry to the intended height, twenty-nine feet above the plain of high water.

Notwithstanding a delay of some days, occasioned by a breach in the canal, which cut off the supply of stone, and the time occupied in removing the derricks and railways and erecting the booms, the pier was completed on the 1st day of August. As the masonry advanced the pumps were but seldom used, the water being allowed to rise with the masonry, in order to give a set to the cement; and when there was no longer a necessity for pumping at dam No. 2, the engines, &c., were removed to dam No. 1, arrangements for the pumping and excavation of which having been in progress for some time.

The machine used last year, for raising mud, proving to be so unwieldy, it was determined not to use it again, and in its stead windlasses were erected over the centre of the dam, lengthwise of it. They were worked by the steam-engine, and were capable of raising nine buckets at a time; they were found to be much more expeditious in raising mud than was the machine, and they were much less liable to get out of order.

The puddling, which was left last year on a level with high water, was filled up to a level with the ties at the top of the dam. The shoring required for the depth of water was arranged in the dam, ready to be fitted and keyed up as the water lowered them to their places.

On the 20th of June, the President of the United States, and the members of his Cabinet, having honoured the work with a visit, the two pumps in dam No. 1 were set to work, and performed admirably, and lowered the water very fast; but it being intended merely as an exhibition of their powers, the pumping was not continued long, as the shores were not quite ready to be keyed up.

On the 23rd, the water in dam No. 1 was lowered to the level of the second tier of shores. The oak piles being very irregular, a great quantity of blocking was required between them and the sheet piles; the blocking was also necessary to bring a proper bearing upon the stringers of the shores, which in consequence of the want of bearing were not keyed up until the day after that work was done.

On the 26th, the water was pumped out to the mud, and the third tier of shores were placed.

This dam did not prove to be so tight as was No. 2; at this stage of the work, several small leaks were observed around it, and one pump was constantly required to keep down the water.

On the 27th, the shores of the third tier were keyed up, and the excavation was commenced. The machinery of the windlasses, however, soon required overhauling and arranging, but on the 29th the excavation was continued.

On the 30th, the leaks increased, and the excavation was discontinued. The labourers were employed in boating clay to replace the puddling, which had settled a little.

July the 1st, the excavation was resumed, but the leaks increased beyond the capacity of the pumps, and the dam filled.

The difficulties encountered in this dam presented themselves at a much earlier period than our experience in dam No. 2 could have led us to expect, and they were of a much more serious character. This is attributable mainly to the fact, that the puddling, a very tenacious red clay, had been in the dam so long as to become too compact to settle down and fill the cavities formed by the water which undermined it.

The first leaks that occurred were through open joints in the sheet piling Various expedients suggested themselves for stopping these leaks; the first was to drive a sheet pile through the puddling to cover the open joint, but it was foreseen that the "montant," or sash pieces, resting upon the mud, would prevent the pile from coming in contact with the sheet piles to cover the open joint; it was therefore not tried. The next was to turn the pumps upon the puddling, so that by softening it, and increasing the weight somewhat, it might the more readily settle.

This process succeeded for a time, but it soon became necessary to excavate the puddling over the open joint, as low down as we could, and then with a heavy piece of sheet piling, used as a ram, to force the puddling down; this succeeded also for a time, but as the excavation of the mud advanced, and the leaks forced their way under the "montant" piles, more effectual means were required, and the puddling was therefore excavated from fifteen to twenty feet in length, over the leak, to a depth of eight or ten feet, a bank being left on the outside to keep out the tides. By keeping the pumps in motion, the water inside could now always be kept down within certain limits. A smooth pile, eight or ten inches in diameter, was then selected, and driven through the puddling to the cavity underneath; the pile was then drawn (the clay being so stiff that the aperture formed by it remained open), and a communication was thus opened with the leak. The period of low water was seized upon, the pumps were turned upon the puddling, and a head of water was created over the opening made by the pile. Dry powdered clay, previously prepared, was thrown in, and being carried down by the force of the water, it filled the cavity below, and stopped the leak.

This expedient, like the others, had its limits, for as the excavation of mud went on, the weight of water increased from without, and it became impossible to create a sufficient head of water to counteract it.

The method of driving piles was nevertheless continued, and they were known to have pierced the leak, by the water following them when drawn. The pumps were not used, but fine clay was poured down the opening until it was filled; a pile, square at the lower end, was then inserted, to force down the dry fine clay. This was a very slow operation, but still it succeeded.

At first these piles were driven by a heavy block of timber, worked by hand over a sheave, suspended at the end of a crane, but the leaks were of such frequent occurrence, and it being apparent, also, that the whole of the puddling must be packed down in this way, a light pile-driver was constructed especially for that use.

By constantly persevering in this method, we finally succeeded in reaching the rock at one end of the dam, but not in time to clear it off and commence the masonry before the winter set in.

Southern Abutment.

Early in the season preparations had been made for constructing a dam for the southern abutment, and it was commenced on the 1st of July, with such modifications and improvements as the experience gained on the 1st and 2nd dams suggested.

The abutment being 34 feet long, and 21 feet thick, with circular wing walls 13 feet average thickness at base, and 69 feet long, the dam was formed so as to enclose the area of the abutment, and leave a small space between the interior of the dam and the masonry.

The interior framing of the dam, as low down as the surface of the mud, was built upon the shore, and was then launched and floated to its position. The framing was as follows:—The lower stringers to rest upon the mud, timbers 18 inches square were laid upon the trace, and simply halved and bolted together at the angles; upon the inside of these, posts 18 inches square and 16 feet 6 inches long, were erected, 8 feet 6 inches apart from centre to centre, in the main body of the dam, and in the wings they were arranged to divide the space uniformly.

These posts were notched on to the stringers, and against the posts were placed the shores, 15 inches square timber. The shores were cut bevelling at the ends, and corresponding notches were cut in the posts, with oak wedges underneath the shores, for the purpose of relieving them when required to be taken out.

The posts and shores were secured to the stringers by two iron straps, with an eye in one end, let into the stringer by a mortise, through which a bolt was dropped by a hole bored from the top. The opposite ends of the iron straps were secured to the shores by a gib and key passing through a mortise in the shores and straps.

Above these, 4 feet 6 inches in the clear, was placed another set of stringers and shores, the stringers 16 inches, and the shores 14 inches square, arranged and secured as those below. Nine feet above this, the top tier, on a level with high water, was placed. The stringers of this tier were 13 inches square, and the shores were 12 inches square. The shores of this tier were not bevelled at the ends as the others, but were set square against the posts, and secured simply by a frame bolt passing through the stringer and post into the ends of the shore.

The ends of the dam were braced by timbers the same dimensions as the shores in each set, let into the stringers with a bearing joint, and secured by

a bolt. The frame was then braced to prevent its wracking, by pieces of sheet piling placed diagonally on its sides, and bolted to the posts on the inside.

The outer side of the stringers were dressed, and each set placed fair above each other.

This framing was floated to its position on the axis of the aqueduct, and was made to sink in the water by proper weights, until the lower stringers rested upon the mud. The pile drivers were placed upon opposite sides of the frame, each with a sheet pile suspended in the planes, and as soon as the frame was arranged in its place, the piles were dropped, and driven and bolted to the stringers, thus securing the frame in its position. The sheet piles were then driven all around, resting against the faces of the stringers, without "montants" or other guides, and *every* pile was driven to the rock. With respect to the outer rows of piles of this dam, they resemble those heretofore constructed, with the exception of the "montants," which were dispensed with, and in their stead temporary guides were used and withdrawn as the sheet piling progressed. Every oak and sheet pile in this row was also driven to the rock. The stringers and ties were all of white oak. The stringers were bolted together, and the joints were covered by short pieces that embraced each, five to seven oak piles. The ties were placed at every other oak pile. Before we enumerate the advantages of this *new* mode of construction, it may be permitted to point out what we consider defects in the old. In the first place, then, the interior row of oak piles used in dams No. 1 and 2, were found to be not only *useless*, but *pernicious*, inasmuch as they cannot be procured of precisely similar diameters, and they could not be worked to *pattern* without great expense, and even then, it was nearly impossible to drive them in so great a depth so accurately as to preserve the alignment all the way down.

Secondly.—The irregularity of the oak piles then affected the sheet piling, because the guides by which they are driven rested against the oak piles; the sheet piles were thus often made to pass each other, and leave open joints.

In dam No. 1, a badly driven oak pile which projected very much into the dam, was cut out, and others that were out of line required to be notched, and of course much weakened, in order to place the stringers for the shores in line: nevertheless, the stability of the dam did not appear to be at all effected. Hence the opinion that these oak piles were both useless and embarrassing.

Thirdly.—The montant piles were found to have caused nearly all the leakage in dams No. 1 and 2. It was under them that the sand and gravel and water found their way into the dams.

Fourthly.—The water in the first dams required to be pumped out to certain depths before a tier of shores could be placed, and when it was pumped out, the space between the oak and sheet piles allowed the sheet piles to spring inwards, by the weight of the puddling, before it was possible to block in between them all around.

Another objection is, that the length of each stringer and shore has to be determined, framed, and fitted before they can be keyed up, and this not for one tier only, but in fact every tier has to be so framed and fitted inside of the dam—an operation involving great inconvenience and delay. All these objections, and they are serious ones, are believed to be obviated in the mode of construction ultimately adopted.

In it, every pile being driven to the rock, the only apprehension of leakage will arise from open joints of the sheet piling, and if this should occur, and it may, by the point of a pile being turned by an obstacle in driving, the joints can be sufficiently closed by driving another pile to cover the opening, there being no montant or sash pile to prevent it.

The inner row of sheet piles being in immediate contact, or resting against the stringers of the shores, there can be no possibility of their springing with the weight of the puddling or pressure of the water, without crushing the shores.

And the shores themselves are made to act as ties, by means of the iron straps at their ends, and prevent the dam from spreading from the weight of the puddling, and of the water in the dam as the tide ebbs (the dam being tight, and having been filled by high water flowing over the top, or by other causes).

The dam, as soon as it is completed, can be pumped down to the surface of the mud, as also the shores required above the mud forms part of the frame work of the dam. Again, the shores and stringers required below the surface of the mud can be framed and fitted upon the sand, inasmuch as we may assume the interior of the dam to be some definite figure, and its dimensions therefore known. In this manner has the dam for the southern abutment of the aqueduct been constructed, and it is a matter of great regret that it could not have been altogether completed and tested this season; but a force of mechanics sufficient for the purpose could not be obtained; another extensive work in the vicinity being in progress at the same time, the demand for labour was very great. Previous to the commencement of this dam, a saw-mill had been contrived by Mr. B. F. Miller, the master carpenter and superintendent of the work, an experienced millwright, and a man of great mechanical ingenuity. It was erected upon the float of one of the steam scows, and was driven by the steam engine at work upon the pumps.

This machine not only saved great expense to the company, but it enabled us to execute much more accurate work, that could not otherwise have been done. By this machine two saws trimmed at once both edges of a sheet-pile perfectly parallel, and enabled us to obtain joints more perfect than we could either by hewing or planing. There was attached to the machine a circular saw also, which was used for cutting out oak wedges and other small pieces.

The work done by the circular saw alone, would nearly have covered the entire cost of the mill in one season. With it, one carpenter and one labourer performed, in one day, the work which last year required from ten to twelve carpenters.

On the 7th of December the winter set in, and the campaign of 183 closed.

Lieutenant M. C. Ewing, of the fourth regiment of artillery, has served wit me during the whole period as my assistant, in whose zeal and industry combined with his theoretical attainments and practical experience, I hav great confidence.

Lieutenant R. S. Smith, of the second regiment of infantry, was temporarily attached to my party, and rendered very efficient service.

Accompanying this report, are detailed drawings of all the machinery used and of the work itself, and also detailed statements of the expenditures of each year, including the cost of machinery, &c. &c.

All of which is respectfully submitted, by

Your very obedient Servant,

W. M. TURNBULL,

Captain and Assistant Top. Eng

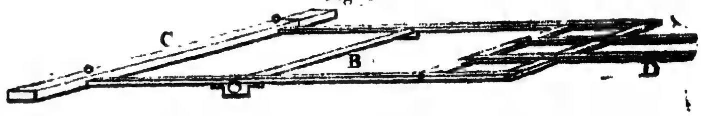
ROAD ROLLER.

Sir,—I beg to enclose you a drawing and description of an improved Roller for consolidating new materials on the public roads, recently purchased by the Surveyors of the parish of Lambeth. It not only act beneficially in common with all other Rollers, but from the compactness o the frame, and the facility of turning sharp round, is available in narrow streets, without inconvenience to passengers and carriages.—Yours, &c.

6, *Chryssell Road, North Brixton.* STEPHEN MUNDY.

N.B.—This is not the first on this construction which has been made, bu it is the largest.

Fig. 2.



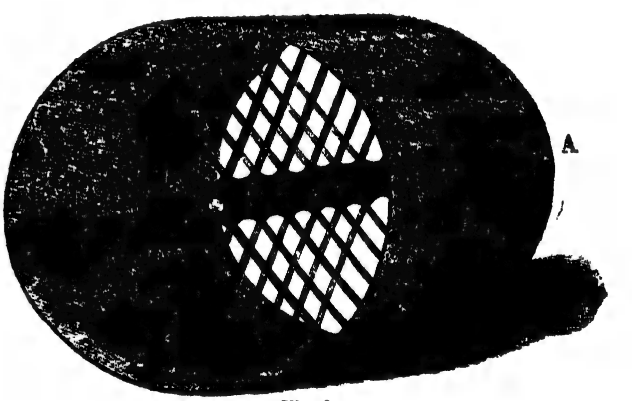


Fig. 1.

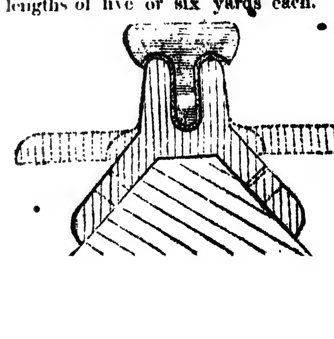
Fig. 1.—A. The Roller, consisting of seven distinct cylindrical wheels wit spokes and boxes, and fitting close to each other at the edge. They are o cast-iron; five feet in diameter, and four feet wide; and weigh three tons.

Fig. 2.—B. Wrought iron axle, engine-turned; three inches diameter.— C. Balance weight to the shafts;—necessary from the weight of the shafts and frame—and forming a shifting scraper to remove stones or rubbish sticking on the roller when in work.—D. Wrought iron frame and shafts.

RICHARDSON'S PATENT COMPOUND RAIL.

This rail is considered by its contriver as possessing advantages over othe rails in common use, in point of economy. Several patterns of it are constructed, some designed for chairs, others for continuous bearings, for which latter plan it is thought to be more particularly applicable. We have accordingly figured one of the latter forms, which is explained in the following description. The dotted lines which we have added, show the form o another pattern, adapted for bearings flat at the top. The figure is drawn to a quarter of the real size.

The top rails are of wrought iron, and weigh from twelve to twenty pounds per yard, and are rolled in lengths of five or six yards each. The lower rails are of cast iron, and can be made of such strength and weight, from one to two yards long, as may be suitable for the traffic which the line is intended to convey.



The wrought rail is bedded in the groove of the cast rail, with compressed felt, and connected together by wrought iron cotters (with allowance for expansion or

to allow of the wrought rail being reversed or exchanged when found necessary from wear, without disturbing the cast rail. The cast rail can be fixed to the blocks or bearers with the patent vertical ties, chairs, and traverses, or in any of the usual ways.

HARPER AND JOYCE'S STOVE.

We have been favoured by a correspondent in Paris with the following important extract from a French journal, which we are happy to lay before our readers in a translation. As containing the opinion of Gay-Lussac, the most eminent French chemist of the day, on the above stove which has excited so much curiosity of late, we hope it will be both interesting and useful. Relying on this most respectable authority, we feel it our duty to caution our readers against the use of these stoves, at least until the inventor has rebutted the heavy charge of M. Gay-Lussac.

It will be seen, that the invention *does not completely obviate* the fatal effects arising from the use of charcoal in close rooms—a practice, the dreadful consequences of which every winter proves, and few more fearfully than the last, recording the sacrifice of four lives in this way, at the seat of General Wyndham. We know not what is the use of a Board of Health in this country, if they do not interfere in such a case as this; and recommend the government to refer the invention to some eminent chemist, that his opinion may be formally given upon it, and officially made public.

"The attention of the Parisian public has been greatly occupied by the announcement of a new species of combustible, or fuel, which gives out neither smoke nor vapour of any kind; and which may be used in stoves, not merely portable, but capable of being carried from one room to another with the same ease as a chair, stand, or similar piece of furniture. This valuable substance is to enable us to warm apartments of any size, at a comparatively trifling expense! and without subjecting us to any of those numerous inconveniences attending open fire-places, which frequently annoy us with smoke, in spite of our best chimney doctors; or else emit heat very imperfectly from the logs of wood consumed in them. After having taken out its *brevet d'invention* in Belgium, it has come to display its marvels here in Paris! and completely revolutionize our domestic economy. An apparatus of the kind is now in use in the Hall where the Academy of Sciences holds its meetings, heated by the wonderful substance alluded to, which is *said to be* free from all impurity, and to give out sufficient warmth without the least smoke or other exhalation. All this was well calculated to excite strong curiosity, which looked impatiently forward to an explanation of the mystery—a solution of the grand problem; for the Academy of Sciences being a temple of science, and not a bazaar for new inventions and contrivances, it is not in the habit of receiving partial confidences in regard to scientific discoveries; but requires that the communications made to it, disclose every thing, without the slightest reserve. Its office is to diffuse light—not to keep it hidden under a bushel. With the schemes and interests of individuals it has nothing to do, but looks only to the advancement of science and the welfare of society; it therefore affords no countenance to discoveries, which are not completely revealed to it. Nevertheless, in this instance, the usual course of the Academy was departed from: M. Delessert who submitted the apparatus to the Academy, explained its contrivance, and exhibited it with the fuel in a state of ignition; but he did not explain the composition of the latter. Without doubt he was not authorized by the inventors to reveal any thing further; but then they evidently committed a mistake, and must have supposed that the Academy of Sciences was just the same as a Society for the Encouragement of Arts and Mechanical Inventions; whereas they ought to have known that, by making a mystery of their contrivance, and not acting conformably with the regulations of that body, they forfeited its favour. In so acting they were very ill-advised, since they could hardly expect that their secret could remain concealed from so many scientific men. In fact, within less than a quarter of an hour it was detected; therefore their caution had no other effect than to deprive them of the merit of frankly disclosing it, which they might have done with perfect security, their property in it being guaranteed to them by the patent they had taken out. In regard to the invention itself, it is far from perfect: while ingenious in its idea, it is apparently very immature in execution, though possibly something really useful may eventually result from it.

The apparatus presented to the Academy consists of two cylinders, the first or outer one being fitted up so as to resemble a sort of elegantly-shaped vase. This cylinder contains within it another, perforated with holes, for the admission of air, and holding the combustible matter; which is neither more nor less than well calcined charcoal, prepared after a particular manner, with the view of preventing the formation of carbonic acid gas, which, as is well known, becomes highly dangerous when the air is strongly impregnated with it. It appears that the formation of this gas is hindered by saturating the charcoal with soda or potass, whereby as quickly as the gas is generated, during combustion, it is absorbed by the base and combines with it, forming a carbonate of potass or soda, which remains in the ashes. Nevertheless, the gas is not so completely absorbed but that some portion of it escapes, as was evident enough at once, on an experiment for that purpose being made. At the same time, there was the principle of an application which may in time be rendered exceedingly serviceable, *when it shall be brought to perfection.*

As to the economy of such an apparatus; it may be easily conceived, if we take into account not the first cost of the combustible material, which is by no means cheap, but the use made of it, whereby none of the heat produced is lost or wasted. It is ascertained that from the fire-places we now make use of, we do not obtain above five per cent. of the caloric supplied by the wood consumed in them; while in this new apparatus, which being free from smoke or vapour, may be placed in the middle of a room, there is not the slightest loss of heat.

Such was the opinion we at first formed; but our opinion is now altered, and we are enabled to speak more positively as to the real value of this pretended discovery, thanks to M. Gay-Lussac, who has considered it his duty to put the public upon their guard in respect to it. And that eminent chemist deserves their thanks for having condescended to examine into its merits; in doing which he has acted as becomes the member of an Academy of Sciences, professing to propagate truth, and expose and dispel error.

Having examined the charcoal imported from England, M. Gay-Lussac found it to consist of light and well-burnt wood; but with regard to the alkaline substance, soda or potass, with which it was supposed this charcoal was saturated, he could detect so very slight (minimum) a portion of it, that he very much questions whether the charcoal had undergone any preparation of the kind at all. In fact, the charcoal does not contain more than a four-thousandth part of such alkali, which is about the proportion every other species of charcoal naturally possesses; so that quite as much carbonic acid gas escapes during combustion as from an ordinary charcoal fire. Consequently this new apparatus cannot be made use of without incurring precisely the same dangers and risks that attend the others. And this is what it is highly important the public should be aware of.

Regarded in the light it must now be, after what M. Gay-Lussac has stated relative to it, this apparatus loses even the merit of novelty; because, with the single exception that it is more elegant in appearance, it is nothing else than the *brasero* of the Spaniards; or, as M. Thénard remarks, the common charcoal-pan used by our retailers in the open streets. But in order to make use of this English warming apparatus with any safety, within doors, it would evidently become necessary to *keep our windows open!* and such being the case, it is far better to adhere to the stoves *(poeles)*, employed by us at present, which give out about nine-tenths of the caloric from the wood burnt in them."

BLASTING OF ROCKS BY GALVANISM.

That gunpowder may be fired by the action of a galvanic battery, is by no means a new discovery; nor that this may be effected at a very considerable distance. We are not, however, aware of this power of the galvanic fluid having been extensively applied to practical uses; and as it appears to be capable of such applications, we feel it a subject of interest both to ourselves and our readers, to state what *has* been done, and to give a guess or two as to what *may* be done with this comparatively new power.

The inefficiency of the common modes of blasting under water, and the danger attending their use in mining operations, are well known. Col. Pasley stated, at a meeting of the Institution of Civil Engineers, on Tuesday, April 10th, that for blasting under water, Pickford's fusee cannot be calculated upon with certainty, except at moderate depths. Mr. Bethell, who for some years past has been engaged in inquiries and experiments on diving, and is the patentee of an improved diving dress, favoured the Institution on the following meeting, April 24, with the result of his practical experience of the effects of a blast ignited by galvanism. This he had been led to devise by having frequent occasion to blow off the decks of sunken vessels, in order to enable the divers to reach the cargo. We will first describe the usual mode of conducting this operation, which is as follows. The charge of powder is enclosed in a tin canister and deposited in the requisite position in the wreck. It is lighted by means of a sort of quick-match, made of cotton steeped in spirits of wine and gunpowder, and then dried. This match is protected from the sea-water by an Indian-rubber tube inclosing it, and inserted water-tight into the canister. These precautions being carefully taken, the fire is conveyed with tolerable certainty to the charge; but as it runs along, it of course blows up the Indian-rubber tube;—a very expensive process when the depth of the water is considerable.

We will now proceed to describe Mr. Bethell's mode of effecting the same object: we could have wished to illustrate it by a sketch, but are unavoidably prevented by want of time. We will, however, undertake to render the matter clear to any one who has ever seen a galvanic battery in action;—perhaps to some others besides. It is well known that a piece of platinum or iron wire, when made to connect two copper wires leading from the two poles of the battery, instantly becomes red-hot, and capable of igniting gunpowder, or even of lighting a spirit-lamp. The problem for Mr. Bethell to solve, was just this: to introduce this same piece of platinum or iron wire into his charge of powder, and keep open when placed in its situation under water, its connexion with his galvanic apparatus in his boat above. This object he effected as follows. To consider first his canister;—in the top is fixed a cork coated with sealing wax, through which descend, water-tight, two vertical copper wires reaching into the middle of the charge. These are separate during their whole course except at bottom, where they are connected by a piece of platinum or iron wire; and at top they rise a little way above the cork, and are curled round into two distinct loops. After the charge is introduced, the top is cemented on the canister with putty. This then being all ready for the explosion, let us consider, secondly, Mr. Bethell's chain of communication. Now, here the difficulty is, that we must have not only two wires, but two wires *insulated*, kept totally distinct as far as their power of communicating the galvanic action is concerned. For this action is wanted *in the canister*; not in the boat, nor in the sea-water. For this purpose, Mr. Bethell coats the wires with a non-conductor; the best he considers to be the caoutchouc solution or varnish prepared by Macintosh and others. His wire is about as thick as common bell wire, and wrapped round with cotton thread, like the wire which the ladies use for millinery. Two of these cottoned wires are

coated with the varnish; when dry they are connected together by thread, and form a galvanic rope which may be laid by for use, in coils of any necessary length. The wires in the canister are likewise separately covered with cotton, and coated with the varnish; except at the two ends, at the one end of which they touch the platinum connecting wire, and at the other the galvanic rope leading from the boat.

And now, his apparatus being ready, see Mr. Bethell proceed to his operations. He has in his boat his galvanic apparatus, coils of rope ready prepared, and canisters ready charged. He takes out a coil; untwists the end for a short distance, removing also the cotton and varnish; he then twists the ends of the two wires one into each of the loops projecting out of the canister-top. The ends of the wires and the loops, both of which we have stated to be without varnish, are then coated separately with sealing-wax —a non-conductor likewise. Thus Mr. Bethell obtains what he wants; a double chain of communication, properly insulated, from his boat to his charge of powder in the canister. He has then only to send down a diver to lodge the canister in its proper place, letting out the galvanic rope as he descends; and on the return of the man, all is ready. The two wires are separated at the end of the rope in Mr. Bethell's hands; he brings one into connexion with each pole of the galvanic apparatus: the galvanic fluid finds an unbroken chain of communication down to the platinum wire in the canister: quick as thought the platinum grows red hot, and the explosion takes place as was desired.

Repeated experience has proved the efficiency of Mr. Bethell's contrivance. He has used a battery of six cells, and has found it sufficiently powerful for his purpose when using a galvanic rope of 100 yards. But so long a rope is seldom necessary in practice; for a charge of two or three pounds of blasting powder is found to produce no other effect than a wave on the surface, when exploded 30 feet under water. Mr. Bethell states, however, that one of Professor Daniel's six-cell batteries will ignite a charge at the distance of 3 or 400 yards. This would insure the safety of the operator in most cases where danger arises from the common modes of blasting; and with more powerful batteries, the effect might be produced at much greater distances;—miles off, says Professor Daniel. The same method is of course applicable to the blasting of rocks under water, an operation frequently necessary in the construction and improvement of harbours, and in other marine works. For these purposes also, Mr. Bethell's improved diver's dress, before alluded to, will be found of great service.

The economy of Mr. Bethell's process is very great. In all cases, the canister is of course blown up: by that which we have been describing, instead of an Indian rubber tube reaching from the boat to the charge, there is destroyed only about six inches of the galvanic rope;—about a foot of common copper bell wire saves, shall we say 50 yards of Indian rubber tube?

Mr. Bethell's improved process is plainly capable of application to all cases where blasting is used. In military engineering for example, it offers the grand advantage of enabling the officer himself in safety and at a distance, to apply the match (as he would say) to a number of mines almost simultaneously, and blow up the enemy with the utmost precision. A galvanic battery indeed would at first amuse both officers and men; but as the novelty wore off, it would take its place among the paraphernalia of war, and make itself respected. It is the frequent fate of useful inventions to be first laughed at, then tried, then used,—and last of all—praised.

We confess, however, that we have always far greater pleasure in witnessing the application of new discoveries in science and ingenious inventions in the Arts, to the pursuits of peace, than to the deeds of war. Man ever appears in the noblest light when employing his intellectual endowments in directing the powers of nature rather to the preservation than the destruction of life. And we do hope that great good will arise from the application of Mr. Bethell's process of blasting to the purposes of mining. Lay in a mine as many blasts as you please;—you may then call off all your miners and place them out of the reach of danger, and explode the whole at once. The superintendent of the mine in his office, or the proprietor in his parlour, may fire all the blasts:—the miner may lay the charge; but let him try to light the copper wires as long as he pleases,—the platinum remains cold till the galvanic fluid darts into it and fires up the explosion at once.

In conclusion, we heartily congratulate Mr. Bethell on his past success,—a success visible, tangible, practical: we bid him hope well for the future; and trust he will not resttill he has convinced the mining world especially, of the great advantages to be derived from the adoption of his invention.

JOINT STOCK COMPANIES.

During the last month there have been numerous companies projected, whose objects are immediately within the province of our Journal, therefore it behoves us to ascertain a few particulars regarding them, that we may be able to put our readers in possession of their merits or demerits. In our present Number we will confine our remarks to two companies of kindred objects—the French Asphalte, and the British Asphaltum Companies; and in a future Journal we will consider the others.

The first company to which we have to call the attention of the profession, is "Claridge's Patent Asphalte Company," formed for the purpose of introducing into this country the Asphalte in its natural state from the mine at Pyrimont Seyssel in France. As we gave some account of this material in our Journal, No. 4, page 60, it is unnecessary for us now to give any particulars of its nature; but we shall confine ourselves to the method of using the material, for the purpose of foot pavements, as lately adopted in Whitehall. The Commissioners of Woods and Forests being desirous to give it a fair trial before they sanction its general introduction, gave directions for the foot pavement to be taken up between Whitehall Chapel and Whitehall Place, and to be replaced by Claridge's Patent Asphalte, which was executed in the following manner. The stone paving was taken up and all the loose rubbish below, to the depth of 6 inches from the surface of the paving; it was then levelled and covered with concrete 6 inches thick, composed of Thames ballast and stone lime. The surface was floated, and then allowed to remain for three days to harden or set; at the end of which time, preparations were made for laying on a coat of the Asphalte. The mineral was brought to the spot in its natural state; it was then melted in portable furnaces with iron pots, similar to portable brewing coppers, out of which it was ladled while hot, and poured over the concrete to the thickness of five-eighths, or three-fourths of an inch. A screed or lath had been previously fixed, extending the whole breadth of the foot paving at distances of two feet, forming a gauge for floating or regulating the surface. As the Asphalte was poured out, one man with a trowel and gauge smoothed the surface, and another sprinkled upon it small pebbles passed through a sieve, which stuck to the surface and formed a protecting coat. As soon as the Asphalte was set (which was within an hour or two after it was laid on), the foot pavement was thrown open to the public. From the *present* appearance it would seem fully to answer the purpose intended; the surface is very hard and even, and is not affected by the wet. Nor do we anticipate that the heat of the summer will have any effect upon it, as it requires a temperature of 560° to melt it, which is about that of melted lead. The same Company have also substituted the Asphalte for the Dutch clinkers in the pavement of one of the stalls of the stables at Knightsbridge Barracks, in which has been placed a very restive horse. These two experiments we consider will give the material a fair trial; it appears to us that it is well adapted for basement floors, vaults, and cellars, both as a substitute for paving, and for covering the top of the arches to render them impervious to wet; as also for lining of tanks, troughs, and drains. But we do not consider it an advisable material for lining floors and roofs, or for any purpose requiring it to be laid on timber, as the material is inflammable, and would burn in a flame in case of a fire occurring in premises in which it was used. Nor can it be employed in London for roofs, without a special Act of Parliament, as the clauses contained in the Building Act will prevent its use for that purpose. We are not aware whether it be intended to submit the material to the severe test of covering the carriageways of London with it; we think the Company will do wisely not to hazard it. We understand that it has been applied for that purpose in Paris; but the traffic of Paris is so widely different from that of London, that what would answer in the former city is no criterion for the latter.

The next material, which we shall now briefly notice, is that of the British Asphaltum and Patent Coal Company. This company have not yet put their material to the test, otherwise than in specimens, which we have seen, and which promise to be good. We have inspected a table top made of the material, which was of a very close, black texture, hard, and difficult to make an impression on with the nail; the surface appeared capable of receiving a polish. There was also a specimen of three hard stock bricks united at the joint by this material; a similar specimen was thrown from the top of a house 40 feet high;—the bricks were broken by the fall, but the joints remained perfect. The British Asphaltum appears to be adapted for the same purposes as we enumerated above; and we are informed that the materials are indigenous to this country. From the statements of the officers of the company it appears that the Asphaltum can be furnished at a very low rate; that the company can lay it down as a substitute for Yorkshire pavement at about 4d. per foot: but this remains to be proved.

We shall continue our remarks on the newly projected companies, in the next Journal: in the mean time, we shall be happy to receive the opinions of our brethren in the profession concerning them; for it is our earnest desire, free from all bias, to form and express an impartial judgment on all new inventions and improvements in the Arts.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

A description of a *new Tide Gauge*, constructed by T. G. Bunt, and erected on the eastern bank of the river Avon, in front of the Hotwell House, Bristol, in 1837. The principal parts of the machine here described, are—an eight-day clock, which turns a vertical cylinder, revolving once in twenty-four hours; a wheel, to which an alternate motion is communicated, by a float rising and falling with the tide, and connected by a wire with the wheel, which is kept constantly strained by a counterpoise, and a small drum, on the same axis with the wheel, which, by a suspending wire, communicates 1-18th of the vertical motion of the float to a bar carrying a pencil, which marks a curve in the cylinder, or on a sheet of paper wrapped round it, exhibiting the rise and fall of the tide at each moment of time. The details of the mechanism, illustrated by drawings, occupy the whole of this paper.

INSTITUTION OF CIVIL ENGINEERS.

Mr. Mushet presented some specimens of malleable iron, in his opinion peculiarly adapted for railway purposes. The feature peculiar to this iron is, the omission of the refining process in its manufacture. The valuable properties of malleable iron being fibre and hardness, Mr. Mushet considers

that these are but imperfectly secured by the present process. Iron, as at present generally manufactured, receives the fibre from repeated heatings and rollings; but fibre thus acquired, is obtained at the sacrifice of hardness. The fibre of malleable iron may be injured by over-heating, by adding in the smelting furnace ores rendering the iron cold, short; or by the use of cinders, which, when in excess, cause the fibre to crystallize and produce brittleness. Some irons, however, are so exceedingly fibrous, that they admit of a limited use of cinders without deterioration. By omitting the refining process, a greater mass of fibre can be produced than in any other manner; and this fibre, in consequence of the iron not being exposed to so severe a degree of decarbonization, is stiffer and harder than that acquired by repeated heatings and rollings. The iron used for railways should be from good grey mine pig-iron, as the source from which the hardest and strongest fibre in malleable iron is derived. The use of cinder-pig should be excluded, on the ground that the quantity and quality of the fibre is injured; and if in the state of grey iron, its fusibility is so much increased, as to occasion great waste in the puddling and subsequent re-heatings.

Paper on the Canal Lifts of the Grand Western Canal, by James Green.

These lifts are not intended to supersede the use of locks in all cases, but in those in which a considerable ascent is to be overcome in a short distance, and in which the water is inadequate to the consumption of a common lock, or in which the funds are inadequate to the execution of the work on a scale adapted to such locks. These lifts are forty-six feet in height, consisting of two chambers, with a pier of masonry between them, similar to those of a common lock, and being of sufficient dimensions to admit a wooden cradle in each, in which the boat about to ascend or descend floats. The cradle being on a level with the pond of the canal, a water-tight gate at the end of the cradle and of the pond of the canal is raised up, and leaves the communication betwixt the water in the canal and in the cradle free, and the boat swims into or out of the cradle. The cradles are balanced by very strong chains running over three cast-iron wheels, and are so arranged that the water in the upper cradle is about two inches below the level of the water in the pond, the consequence of which is, that the upper cradle has a slight preponderance, just sufficient to set the machinery in motion; the weight of this additional water being generally about one ton; it may, however, be regulated at pleasure. The principle of action in always maintaining the equilibrium between the cradles, is the well known one, that a floating body displaces a volume of fluid equal to its own weight. The cradles, when full of water, or when either or both of them contains a boat, will balance in any position; an additional weight of water in the descending cradle being necessary just to overcome the friction and the vis inertiæ of the machinery and cradles. It is obvious that the weight of the additional length of the suspending chains on the side of the cradle which is the lowest must be counterbalanced; this is effected by attaching to the under side of each cradle a chain of equal weight per foot with the suspending chains; and this, elongating under the ascending, and shortening under the descending cradle, removes the disparity in weight. The strength of materials is the great desideratum in machinery of this nature; and though the lifts here described are but forty-six feet, and the boats about eight tons, yet the same method is applicable to much greater heights and much heavier tonnage. The advantages of these lifts over common locks are great economy of construction and great saving of time and water, the time occupied in passing one boat up and another down this lift of forty-six feet being but three minutes, whereas in common locks to pass the same height would occupy thirty minutes. Also the quantity of water consumed is about two tons for eight tons of cargo, whereas in common locks it is about three tons of water per ton of cargo.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

Amongst the many proofs of an improvement in our social state, we have to observe the greater frequency of conversazioni given by members of the higher ranks of society, distinguished for their taste and learning, to the professors of the liberal arts. An invitation of this agreeable nature was issued for the 2nd of last month by the Noble President of the Royal Institute of British Architects, Earl de Grey. To the interest afforded by the display of the beautiful works of art in the possession of his lordship, was added that of many highly interesting productions in history, landscape, and architecture, by eminent living artists, many of whom were present. Amongst the company were several noblemen and gentlemen, distinguished lovers and encouragers of art and science; and the charm of the evening was rendered complete by the presence of several ladies of rank, whose appreciation of the various works, flatteringly evinced to their authors, formed a very pleasing feature in this conversazione. The magnificent suite of rooms presented a very brilliant appearance, and the numerous attractions which they contained had the effect of retaining the company till a late hour.

The following distinguished noblemen and their ladies were present:— The Duke and Duchess of Sutherland, the Marquis and Marchioness of Lansdowne, Lord and Lady Burlington, Lord and Lady Lyndhurst, Lord Aberdeen. The family of the noble host, Earl de Grey, also graced the party by their presence. There were present also the following gentlemen, distinguished in the scientific world:—Sir Edward Cust, Sir Henry Halford, Sir Richard Westmacott, Sir William Newton, Sir Francis Chantrey, Sir John Rennie, Sir Jeffery Wyatville; numerous members of the Royal Academy; the President and several members of the Institution of Civil Engineers; of the Architectural Society, and of other scientific and learned bodies in the metropolis.

At an Ordinary General Meeting of the Members, held on Monday, the 9th of April, 1838,

P. J. Robinson, Esq., V.P., in the Chair,

His Grace the Duke of Northumberland was elected an Honorary Fellow.

The following gentlemen were elected as Associates:—Andrew Moseley, of 21, Lincoln's-Inn Fields; Edward Charles Hakewill, of 8, Kent-terrace, Regent's-park.

A letter was read from M. de Lassaulx, of Coblentz, acknowledging, with thanks, his election as Honorary and Corresponding Member.

Several donations were announced as having been received.

Mr. A. H. Renton read a paper "On the nature, properties, and elementary principles of Iron," in continuation of his course.

Mr. Britton, Honorary Member, read a very interesting paper, on the architectural characteristics of the *porticos* of Greek and Roman temples, and the *porches* of Christian churches. He commenced by some judicious observations on the necessity of adapting and applying designs to the climate, peculiarity of situation and destination of a building; and on the misapplication of the forms of ancient architecture to modern and trifling purposes: and further rebuked the enthusiastic admiration which is so constantly manifested, for every thing of Grecian origin. In the eastern parts of the globe, it was remarked, where architecture was at an early period advanced to high perfection, the climate impelled builders to provide a shelter from the heat of the sun, rather than from the violence of wind and storms. Hence even in the extremely ancient temples of Egypt, and the excavations of Hindostan, an anterior space was covered in, and fronted by a range of columns, forming, if he might be allowed to say so, a sort of architectural parasol. This arrangement he illustrated by referring to some beautiful drawings of Ellora in India, and Appollinopolis-magna at Edfou in Egypt, which, with many others subsequently noticed, were suspended in the room. In Greece, a similar appendage was universal; with an inclination of the roof, which produced the pediment, and thus completed the architectural composition of a portico. Mr. Britton proceeded to define the different parts, and the most common varieties of ancient porticos; illustrating his remarks by reference, first to the principal temples of Athens, Pœstum, and other Greek designs; and next to those of ancient Roman buildings. In noticing that of the Pantheon he cautioned the young architect against trusting too implicitly to the hyperbolical language of encomium used by Mr. Forsyth in his description of that portico; and passed censure upon the injudicious combination of curved and straight lines which it presents. Proceeding from the *portico* to the *porch*, Mr. Britton pointed out the occasional variation in the form of individual examples of the *porch*, its peculiar adaptation to the exigencies of a rigorous climate, and the circumstance of its forming more an object of utility, and less of paramount beauty, than the portico. That decoration, however, was by no means neglected in the porch, was proved by the drawings exhibited. Being so well suited to the climate of this country, it was not surprising that England presented an infinitely greater number of porches than any other part of Europe; it was indeed one of those members of ancient architecture which might be said to be indigenous to this country. The earliest examples remaining, were of the Anglo-Norman era. Mr. Britton entered into a minute description, referring to drawings, of those at Malmesbury Abbey Church; Southwell Collegiate Church; St. Margaret's Church, York; Bishop's Cleeve Church, Gloucestershire; Barneck Church, Northamptonshire; and Durham Cathedral (the Galilee); all of this early period. The fourth of these (at Bishop's Cleeve) has never been engraved, and from the sketches exhibited, it appears to be one of the most interesting porches now left; exhibiting a variety of ornamental mouldings, intersecting arches, and other curious features. The porches of Wells, Ely, Hereford, Lincoln, Salisbury, and Peterborough Cathedrals, particularly the two latter, afforded good examples of the earlier and middle periods of pointed architecture; those of a subsequent date being for want of time deferred till another evening.

At an Ordinary General Meeting of the Members, held on Monday, the 23rd of April, 1838,

J. B. Papworth, Esq., V.P., in the Chair,

Several donations were announced as having been received.

Mr. Renton continued his course "On the nature, properties, and elementary principles of Iron;" illustrating his observations by drawings, exhibiting the comparative advantages of various forms of section.

A paper was read by R. W. Billings, Associate, "On the plan and decorations of the Temple Church, London: particularly with regard to their typical signification in reference to the doctrines, customs, and ceremonials of the Knights Templars."

ARCHITECTURAL SOCIETY.

The above Society held a Conversazione at their Rooms, Lincoln's-Inn Fields, on Monday evening, April 9th. It was attended by a very numerous company of the profession, and patrons of Architecture; amongst whom we had the gratification of observing the noble Earl de Grey, President of the Royal Institute of Architects. A letter was read by the President, W. B. Clarke, F.A.S. &c., stating that his Royal Highness the Duke of Sussex, the Patron of the Society, was prevented from attending by indisposition. Numerous donations were then announced by the Secretary, from C. Manby, Esq., C.E., and J. Nash, Esq., Amateur Members; and from several other

members; after which the President delivered an address, of which we give the following abstract.

He began by briefly adverting to the first rise of the Architectural Society, and the objects for which it was formed—the obtaining of knowledge by the co-operation of the members, and the affording to their younger brethren of the profession such advantages as they themselves possessed; thus exhibiting the laudable character of the Institution, and disclaiming all feelings of rivalry with other and posterior institutions. He proceeded to notice, with much satisfaction, the honour and benefit conferred upon its members by the patronage of his Royal Highness the Duke of Sussex. On this noble prince, a high and deserved encomium was passed, for his constant readiness to further, by his countenance and support, the interests of science and art. After alluding to the interest felt by the late venerable Sir John Soane in this Society, whose direction the infirmities of age alone prevented him from assuming, the President proceeded to notice the advantages derived by the Fine Arts, and especially Architecture, from the patronage of a wealthy aristocracy. Referring our present advance in the Fine Arts to the encouragement of George the Third, as the original exciting cause of the genius of our countrymen, he anticipated great further improvement, especially in Architecture, from the increased diffusion of taste, and particularly of architectural knowledge, among the masses, both educated and uneducated; and this advance of taste and science was stated to be one of the leading objects of the Society. The address concluded with an expression on the part of the President, of diffidence in his own qualifications, and of an earnest desire to give place to some distinguished professor of Architecture.

The Rooms were hung with numerous designs, by members, of buildings now in the course of erection under their superintendence. Amongst these we observed the names of T. H. Wyatt, V.P.; George Mair, V.P.; George Moore, William Grellier, E. H. Browne, T. T. Bury, T. L. Walker, B. Ferry, &c. &c. Several portfolios were on the tables; that of Mr. Jos. Nash, Honorary Member, afforded great and deserved gratification. The drawing of the Weedon Aqueduct on the Birmingham Railway, by Mr. Dodsworth, excited considerable attention, from its great merits. Some drawings by F. Arundall likewise were the cause of much admiration. We must also remark that the window of stained glass, tastefully lighted up in the room, exhibited a remarkably fine specimen of that art; it is the work of Hoadley and Oldfield, of the Hampstead-road. The company separated at a late hour, evidently much gratified and interested by the entertainment afforded.

THE MANCHESTER ARCHITECTURAL SOCIETY.

The fifth *conversazione* of this Society took place in their Rooms, Mosley-street, on Wednesday evening, April 4th. There was a numerous attendance of the members and their friends, and the *soirée* was of a very delightful and instructive nature. Amongst the works of art exhibited were drawings by Prout, Stanfield, Cattermole, Aspland, Crouch, and R. Lane; two clever drawings by J. W. Hance, one a view of Windsor, the other a design for a new Exchange; several very spirited female heads by C. A. Du Val, &c. There were two cabinet pictures by Bradley, one by Liverseege, a fine landscape by J. W. Frazer, Esq., and a very clever painting ("a boy selling fish") by C. A. Du Val. George Peel, Esq., contributed three exquisite bronzes; and Messrs. Agnew, Grundy, and Zenetti, also furnished numerous works of art.

The Society being desirous of exhibiting the designs lately sent in competition for the Catholic Church in Manchester (under the impression that public examination is the most effectual mode of insuring just decisions in competitions), such architects as were candidates are invited to forward their designs as early as possible to the Society's Rooms, 45, Mosley-street, where every information relative to the proposed exhibition may be obtained.

LAW PROCEEDINGS.

VICE-CHANCELLOR'S COURT, *March 10th and 12th.*

HEATHER AND PRITCHARD *v.* POSTLEWHITE AND DAY.

This was a motion on the part of the plaintiffs, the contractors for building a new Roman Catholic Chapel, at Hereford, against the Reverend Mr. Postlewhite, and his architect, Mr. Day, for an injunction to restrain them from proceeding to finish the Chapel, which had been partly erected by the plaintiff.

The affidavits on the part of the plaintiffs stated, that in July, 1837, they entered into a contract with the defendant Postlewhite, to erect the chapel in question, under the superintendence of Mr. Day, for the sum of 5,681*l.* The defendant Day had power to dismiss the workmen, to remove such parts of the works as he should disapprove of, and employ other workmen in case of any negligence on the part of the plaintiffs. It was also agreed, that whenever the defendant Postlewhite received a certificate during the progress of the works from Day, that the amount of the works therein specified had been completed to his satisfaction, Postlewhite would, within the space of fourteen days, pay to the plaintiffs a sum of money equivalent to two-thirds of the value of the work done, and mentioned in the certificate, and pay the balance within one month after the whole was certified to have been completed. No certificate was to be given for a less sum than 750*l.*, and all moneys payable for any default of the plaintiffs, was to be deducted therefrom.

The plaintiffs' affidavits further stated, that the plaintiffs proceeded to execute the works in a proper manner, conformable to the specification—that during the progress of the works the defendant Day acted in an arbitrary, tyrannical, and capricious manner—that the plaintiffs verily believed the object of defendants was to get the chapel built at the expense of the plaintiffs, without paying for the same—that the defendant Day had refused to grant certificates, although work to a large amount had been done—that the defendant Postlewhite was a priest of the order of Jesuits, and had made a vow of poverty, and the plaintiffs believed he was unable to pay for the work—that notices were given from time to time by Day, and his two clerks of the works, which were capricious and unreasonable—that although the plaintiffs had put up sufficient scaffolding, Mr. Day had, without cause, objected to it as insufficient—that he had also complained without cause of the bricks, sand, and mortar, and had required more men to be employed on the works than were necessary—that on the 31st October they wrote a letter requesting a certificate—that in answer thereto they only received a letter, saying, Mr. Day would not be trifled with—that by reason of Mr. Day refusing to grant certificates, they became unable to proceed with the works for want of funds—that the plaintiffs wrote several letters to Mr. Day, and were answered by notices to proceed with the works—that upon the 7th of December the plaintiffs received notice to move their bricks and materials, and were excluded from the works. The plaintiffs' affidavits contained a variety of other statements, having for their object to show that the works were done by the plaintiffs in a sufficient and proper manner, and that there was no just cause of complaint.

The affidavits, on the part of the defendants, denied in the most positive terms the fraudulent intention suggested by the plaintiffs, of procuring the chapel to be built without paying for the same. The affidavits further stated, that it was well known to the plaintiffs that Mr. Postlewhite was a Roman Catholic priest, and that up to the time of the filing of the plaintiffs' bill, no doubt was ever suggested by them as to Mr. Postlewhite's ability to pay. Mr. Postlewhite's affidavit stated, that he had ample funds under his control to meet the payments of the contract. Mr. Day also denied, in his affidavit, the imputation on his conduct made by the plaintiffs, stating that he had no interest in the chapel, further than his professional employment as the architect, and that he was only desirous to do justice between the parties.

It further appeared by the affidavits, that Mr. Day had from time to time, during his absence from Hereford, received letters from Trow, his clerk of the works, and from Thornton, who succeeded Trow (which were set forth in the affidavits), complaining in very strong terms of the conduct of the plaintiffs and their workmen, in disobeying the directions and notices given, doing the works improperly, and using improper materials—that Mr. Day, finding it necessary to dismiss Trow, the plaintiffs immediately took him into their employ, and employed him upon the works until Mr. Day compelled them by a notice to remove him—that the plaintiffs disobeyed the notices of Mr. Day and his clerks of the works—that at the time when he received the plaintiffs' letter of the 31st October, he also received a letter from his clerk of the works, complaining of the works being done in a very improper manner and contrary to orders, and adding, that he was put at open defiance by the contractors. That in consequence of this conduct, the works were in the beginning of November suspended—that on the 10th of November the plaintiffs and their sureties, and Mr. Day, had a meeting, at which the plaintiffs undertook to provide proper scaffolding to Mr. Day's satisfaction, and to resume the works as soon as possible afterwards—that scaffolding having been erected, the plaintiffs resumed the works on the 21st of November—that Mr. Day was then absent from Hereford—that Mr. Thornton, his clerk of the works, discovered that the plaintiffs, instead of using bricks, the produce of the best kilns, as the specification required, were using clamp-burnt and inferior bricks—that in consequence of the complaints of Mr. Thornton, disputes arose, and the plaintiffs, on the 25th of November, quitted the works, and never after resumed them—that Mr. Day, on the 27th November, having been informed of these proceedings, went to Hereford, and in consequence of the plaintiffs having quitted the works, he afterwards, under the powers given by the contract, employed other persons to proceed with them, having previously given the plaintiffs notice to resume the works—that on the 30th of November the plaintiffs, instead of resuming the works, served him with a demand for a certificate, to which Mr. Day gave the following answer:—"In answer to your application for a certificate, I have to state, that in my judgment you are not entitled to one, and I therefore for the present refuse to grant it. When you shall have resumed the works which you have discontinued, and I am satisfied that the works done shall entitle you to a certificate, it shall be immediately granted for such a sum as in my judgment I shall think sufficient and proper." That the plaintiffs never did resume the works as required, and that it was questionable whether the works done were sufficient in amount to secure the due performance of the contract without calling upon the sureties. The affidavits, on the part of the defendants, stated a variety of instances in which the contract had been departed from, and amongst others, that although the contract provided that the plaintiffs should make no sub-contracts for any of the works, without the consent, in writing, of the architect, the plaintiffs had, without his knowledge, made sub-contracts for the plumbers', painters', and glaziers' works.

Mr. Knight Bruce (with whom were Mr. Jacob and Mr. Stuart) stated the case for the plaintiffs. Mr. Bruce said—The question which the court was now called upon to decide, was whether the defendants were to have the full benefit of the heretical bricks and mortar, the heretical timber and labour of the plaintiffs, without paying one single farthing for them? The court would have to decide whether this Jesuitical chapel was gratuitously to belong to the defendant, the Rev. Joseph Postlewhite. By the deed, Day became sole arbitrator between the parties, and supposing him capriciously or

corruptly to refuse to give any certificate, and declare the work not done to his satisfaction, the plaintiffs were concluded by his award, and deprived of their right at law to recover one farthing under the terms of the agreement. A court of equity would not however, he hoped, hold that a person who had given both his time and labour in a just and proper compliance with the stipulations of a solemn contract, should be deprived of all just remuneration by the capricious, corrupt, or even erroneous judgment, by which an arbitrator thought proper to withhold his certificate. It might happen, that an arbitrator, acting fairly and honestly, might arrive at an erroneous conclusion, and that great difficulties might thereby arise, which the court would find it difficult to correct; but before the court came to a conclusion of that description, it ought to satisfy itself that in the position in which Mr. Day was placed between those parties, he had acted impartially and judicially.

After a variety of other remarks, the learned counsel submitted, that the court ought to extend its protection to the plaintiffs. He said, that the court in this case could pursue no middle course; it must either consider, by the terms of the contract, the plaintiffs were entitled or not to receive a certificate, at the mercy and capricious will of Day, without his giving any reason. The injunction which the plaintiffs asked, was to restrain the defendants from proceeding with the works, the plaintiffs not objecting to waive the agreement, if the court would prevent its being set up in a court of law against an action to be brought by the plaintiffs for the work and labour actually done.

The Solicitor-General, Mr. Wigram, and Mr. G. Richards, appeared for the defendants; but

The Vice-Chancellor, without hearing the counsel for the defendants, proceeded to give judgment as follows:—

I shall not hear the other side. The question is not before me whether the plaintiffs shall be paid anything or not, or what shall be paid; that is a question which can only be decided at the hearing: but I am asked now by the plaintiffs in effect to prevent the progress of the building of that chapel, which is the subject of the contract, and which chapel, as I understand it, was by the contract to be completed on or before the 1st of November, 1838.

Now it really appears to me that it will be a very arbitrary and very tyrannical thing, after the course of conduct that has been pursued by these parties towards each other, for the court to say, that in effect the building shall not be completed; and that would be the effect of granting the injunction.

The right of the plaintiffs to be paid on the principle of *quantum meruit* for what they have done, remains unaffected if I refuse the injunction; but if I was to grant the injunction, it would be putting the defendants in a situation in which, according to the simplest view of the contract, and even the view taken by the plaintiffs themselves, they ought not to be placed.

I am desired to interfere on the ground, as it is alleged, of the arbitrary, oppressive, and tyrannical conduct of Mr. Day. Now, for aught I know, there may have been some instances in which Mr. Day may have been misinformed, and there may have been circumstances with respect to which he has formed an erroneous judgment; but I find in his affidavit, more than once, that he does positively, in the most express manner, deny that he has acted in any such spirit as arbitrator in a vexatious or tyrannical spirit; and I do find this, about which there is no dispute; that, in the first place, it was one of the things plainly specified, that all the bricks should be *kiln-burnt bricks*; and it seems to be admitted as a fact, that the bricks were *not* kiln burnt, but that, in effect, they were what are called *clamp-burnt bricks*. The allegation of the plaintiffs is, not that they were kiln burnt bricks, but that, with some exceptions, they were as good as kiln-burnt bricks: there is one plain violation of the specification; there may be a qualification of the violation, but the specification has been violated.

Then there is that said with regard to the iron tie, which in effect so far as there was, in the first instance, a making of the work according to the specification, clearly has been omitted; *that* is plain on the affidavit, which has been put in by way of reply to Mr. Day's affidavit. Mr. Day states what took place circumstantially; in some respects he is contradicted, but the substance of the fact, that there was a deviation from the specification, is admitted.

Then it should be observed, that Mr. Day of necessity could not constantly be on the spot. But what do you find? Why, you find that so long as Mr. Trow was the clerk of the works for Mr. Day, he writes the letters to him, stating the improper species of conduct on the part of the plaintiffs, and upon that, it appears that Mr. Day's mind was so much excited, that he came himself to Hereford and looked at the works; and then, though complaints had been made to him by Trow, that the plaintiffs had not been properly carrying on the works, he was personally satisfied in his own mind that Trow had himself not been sufficiently vigilant, and for that reason he dismissed him—that was on the 4th of October, 1837. Then it appears that Thornton was appointed to succeed Trow, and Thornton came to Hereford, and began his superintendence as clerk of the works on the 26th of October, 1837; and then we find that, from that time, Mr. Thornton is continually making representations to Mr. Day, by letter, as to the improper conduct on the part of the plaintiffs.

I admit it is exceedingly possible that in many of those representations made by Trow and made by Thornton there might have been something erroneous. But what was Mr. Day to do? It appears that Mr. Day made several journeys to Hereford on purpose himself to superintend what was going forward, and that it had been stated to him, both by the person whom he dismissed and by the person whom he subsequently appointed, that there were improper courses adopted;—then when he comes on the spot and sees what is going forward, am I to assume, because his judgment coincided with that of Trow and Thornton, that he has acted in an arbitrary, tyrannical, and capricious manner?

It appears to me, that though he may have been mistaken, and though perhaps he may have acted in a pettish manner with regard to the words he used, or with regard to the language he inserted in his notes, it is too much, upon these affidavits, for me to say he has acted in such an improper manner, that I am compelled to go against the language of the contract, which, as I understand it, does authorize his employing other workmen than those of the plaintiffs for the purpose of completing the works;—and that is the sort of very imperfect step towards an ultimate relief which the plaintiffs say they are entitled to, and to which, for aught I know, they are entitled,—that I am to stop the progress of the works, and that they are not to have the chapel completed by the 1st of November, 1838, if it can be. It really appears to me, I must say, that there is not enough upon these affidavits, as they are laid before me. There is not such a case made out as would justify me in saying that the conduct of Mr. Day has been that arbitrary, capricious, and tyrannical conduct with which he is charged, and which he expressly swears it is not; and it is impossible to say how much of bad conduct is to be passed over, and how much is to be visited with severity. If the plaintiffs had made out that in every instance they had complied with the specification,—there would have been ground for the complaint of arbitrary, tyrannical, and capricious conduct on the part of Mr. Day; that would be a very different case,—but that is not made out on the affidavits distinctly, on their own showing: and my opinion is, I am not at liberty to grant the injunction; and my opinion further is, that the injunction sought for is so little ancilliary to the relief which the plaintiffs asked,—that there is so little ground for asking it,—that I am bound to refuse the motion with costs.

April 19th.

SEMPLE *v.* THE LONDON AND BIRMINGHAM RAILWAY COMPANY.

This was an application to dissolve an injunction which had been granted to restrain the Company from laying down, carting, &c., any clay, &c. on the Commercial Road, which runs between the plaintiff's wharf on the Regent's Canal and the station of the company in the Hampstead Road, and from continuing any impediment to the plaintiff's use of it. The facts were, that a person named Reading, who had contracted with the company to carry 20,000 yards of clay to their station, being on the 1st of March last unable to go along the usual road into the station, by reason of the thaw, carted the clay up the Commercial Road, and deposited fifty-three loads opposite the plaintiff's gates, with the view of wheeling it across planks and a scaffold, erected for the purpose, over the wall into the company's grounds. On the next day he received a notice from the engineer of the canal, not to cart any more, as it caused an obstruction and the road was private: upon this, the scaffolding was taken down; but the clay remaining, the bill was filed on the 10th of March for the injunction, which was granted on the 12th; before it was obtained, the defendants began to clear away the clay, and it was all removed on the 13th.

Mr. Jacob, for the defendants, insisted that the depositing was only a *temporary* measure, and had been done by their contractor in ignorance, who ought to have been a party defendant; that the company had a right of way up the road, and that no obstruction had been created; and that plaintiff knew the clay was being removed when he applied for injunction, and ought to have delayed proceedings.

Mr. K. Bruce and Mr. Stinton for plaintiff, contended that there was an obstruction, and that whether defendants had a right of way or not, they ought not to have obstructed the road. If plaintiff had not restrained them immediately, there might have been a repetition of the nuisance, and then plaintiff would have been told that he was barred by his former acquiescence.

The Vice Chancellor,—There is no doubt in this case that the acts of the defendants were wrongful, and that the deposit created inconvenience, by which I mean considerable obstruction to the plaintiff's wharf, so that it was very difficult to approach it. This is clear from the affidavit of plaintiff, who states that the timber could not pass, and that his horses and carts were prevented turning, so that there was a material obstruction. The defendants were conscious of this, for they took steps to remove the scaffolding, &c., immediately upon notice; and then it is said that the plaintiff ought to have awaited the removal instead of immediately applying for an injunction: but he had a right to apply, especially as it was evidently intended to bring in a much larger quantity. The plaintiff thus stopped any possible ulterior injury. All the clay was not cleared away when the bill was filed, so plaintiff was not bound to consider whether it would take time to remove it, especially as the deposit was made in two days, but five or six were occupied in removing it. The injunction must stand, and the motion be dismissed with costs. A. A.

MEETING OF SCIENTIFIC SOCIETIES.

Civil Engineers' Institute every Tuesday evening.

Royal Institute of British Architects, Monday, May 7, at three o'clock, Annual General Meeting of Members only. Monday evening, May 21.

Architectural Society, Tuesday evening, May 8.

PARLIAMENTARY STANDING ORDERS.

The House of Commons on the 26 ultimo appointed a Select Committee, "to consider the standing orders of the House of Commons, relating to private bills, and to compare them with those of the House of Lords, with the view of assimilating as much as possible the standing orders of both Houses."

We believe we were the first who called the attention of the Public to the evils existing in the present standing orders of the House of Commons; our observations on the subject will be found in our first number, for October, and subsequently, in our third number, for December. As we stated then, we had no objection to the standing orders of the House of Lords; we considered them framed in the best spirit; and we are still of the same opinion. We sincerely hope that the Lords will not consent to alter one of their standing orders, but compel the Commons to frame their orders conformably to them. And we do hope that there will not be any more silly attempts to frame standing orders, to prevent speculation and gambling on the Stock Exchange. If they are not allowed to have railway shares to speculate upon, they will always have others; as at the present time, they have Asphalte and other companies starting up daily.

PROGRESS OF RAILWAYS.

The Hull, Lincoln, and Nottingham Railway.—This line is now in a fair way of going on; it has been taken up with great spirit on the line, and numerous applications have been made for shares. The importance of the undertaking is greater than might at first be thought; but upon a reference to a map, it will be at once seen that this line will be most important, as it will complete a diagonal chain of railways through England, connecting the German Ocean with the Bristol and English Channels, and forming the nearest route from London by forty-five miles to the important port of Hull. It will also be twenty-five miles nearer by this line from Birmingham and all the great manufacturing towns in the midland counties to Hull, thus offering a rapid and cheap communication for the conveyance of the goods from our manufactories for all the northern countries of Europe. The line for many miles will be formed on the present surface, with no other expense than levelling the land, and laying down the rails. Lord Yarborough, and all the great landholders on the line, give it their hearty support, and several of them have offered to take the value of the land in shares: others have offered timber and stone, to be paid for in the same way. This is a spirit which ought to be encouraged by Parliament, and we hope will form an example for other landowners coming forward thus liberally on other lines, instead of driving them off their estates.

The Northern and Eastern Railway.—After a long period of inaction and doubt, the works upon the London and Cambridge Railway have commenced, and are now proceeding with activity. The point selected for the first operation of the contractor (Mr. Mackintosh) is Tottenham Mills, and the facility with which the first mile and a half has been nearly finished in the short space of three weeks, demonstrates the advantages which the company will enjoy, in point of cheap and rapid construction, as compared with all others. The survey between Broxbourne and Royston is now nearly concluded, and the negotiations for the land will immediately commence. In the parish of Edmonton a violent opposition is to be offered to the company's surveyor by the owners and tenants of certain large farms intersected by the line, who have sent in claims of a most preposterous nature, and thus compelled the company to have recourse to so fortunate a circumstance.—*Hertford Paper.*

Manchester and Sheffield Railway.—The works are to be forthwith commenced.

Southampton.—Our railway is progressing rapidly, and it is calculated that twenty-five miles of it from London will be open on the 1st of May.—*Hampshire Telegraph.*

To London in One Day.—In consequence of the opening of the greater part of the London and Birmingham Railway, the journey from Liverpool and Manchester to London can now be performed in one day. Passengers who go from Liverpool and Manchester by the Grand Junction trains at half-past six in the morning, will arrive at Birmingham soon after eleven, and will have from that time till one o'clock for dinner or business, when the trains leave for London, where it is expected they will arrive soon after eight o'clock:—and passengers leaving London by the half-past seven trains will arrive in Liverpool or Manchester between nine and ten in the evening. The arrangements for the conveyance of the mails by the London and Birmingham line, we understand, will not be completed before the 7th of May, after which day the London bags will reach Liverpool about ten o'clock in the morning.

Great North of England Railway.—The works of this undertaking at Northallerton and its vicinity are now in full progress; the foundations of the first bridge, connecting the old Roman camp (over which the railway will have to pass) with the Castle Leazes, were commenced on Tuesday last.—*Leeds Intelligencer.*

Midland Counties Railway Company.—A special general meeting of the proprietors was held at the Bull's Head and Anchor Hotel, Loughborough, on Friday, the 23rd of March, for the purpose of ratifying an agreement entered into by the directors, with the North Midland Railway Company. The chairman, James Oakes, Esq., having explained the object for which they were assembled, considerable discussion ensued, and the utmost unanimity of opinion, as regarded the agreement with the North Midland Company, which is now definitively settled, prevailed. We understand that agreement to be, that the North Midland Company bound themselves for the term of seven years to transfer all their traffic southward from Derby to the Midland Counties Railway; with a power, however, to put an end to it, should any other company, for three successive months, carry their passengers and goods at lower rates, and in the same average time.

Gloucester and Birmingham Railway.—The company is now proceeding vigorously with this important undertaking, and the line between Cheltenham and Worcester bids fair to be completed within the time specified. The contractor who has taken the portion from the depôt to Maude's Elm is advancing rapidly with the works under his direction. Since the severe frost has left us, the workmen have made visible progress at Alstone, and the road which runs in deep cutting under the present Gloucester road, has been sunk down several feet, for a considerable distance through the land near Mr. Prescod's residence. The depôt is to be placed on the Cheltenham side of the Gloucester road not far from the junction of the present Leckhampton tram-road. The company, it is understood, have come to an arrangement with the Cheltenham and Swindon Company respecting the formation of the line hence to Gloucester, and the opposition raised by them to the Swindon amended act, is we believe in consequence withdrawn.—*Cheltenham Looker-on.*

Sheffield and Rotherham Railway.—The directors have let the different works of the Sheffield station to Messrs. L. G. Reed and Co., of Broomhall Street, builders; and the Rotherham station to Mr. Blackmoor, of that town; both are to be completed by the 1st of July next. The entrance for passengers to the Sheffield station will be by three handsome iron gateways—one for carriages and two for foot. They will be erected at the corner formed by the junction of Saville Street with the Occupation Road (now part of the Wakefield turnpike) and will face directly up the Wicker, forming a bold and interesting object of view from that spacious street. A commodious shed, about 200 feet long and a corresponding width, supported on metal columns, will cover the passenger-station and booking-offices. The entrance for goods is proposed to be near the present gateway to Mr. Alfred Sorby's house at Hall Carr. The gate to the coal yards will be a little further on. Here there will be a staith so constructed that coals may be transferred from the railway with the greatest facility. The station in Westgate, Rotherham, will be provided with a shed of similar construction to the one at Sheffield. The branch to connect this railway with the North Midland at Masbrough, has been let to Mr. John Stephenson, the contractor for the main line.

Sheffield and Rotherham Railway.—The works at the railway are proceeding with great rapidity, and are expected to be so far completed in August next, as to enable the directors to make a formal opening of the same. In addition to the locomotive engines previously ordered, Messrs. Bingley and Co., of Harper street Foundry, in this town, have just received orders from the company for engines to be ready shortly after the opening.

Chester and Crewe Railway.—Mr. Stephenson states that the line may be opened to the public in eighteen or twenty months after breaking ground. Satisfactory arrangements have been made with almost all the landowners through whose property it will run.—*Midland Counties Advertiser.*

The Maryport and Carlisle Railway.—At a meeting of the directors held at Maryport, on Saturday, the 17th ult., Sir Wilfrid Lawson, Bart., of Brayton Hall, in the chair, the construction of the first portion of the railway, comprising that part of the line between Maryport and Gilcrux, was contracted for. Mr. Irving is the contractor for the excavations, and Mr. Nelson, of Carlisle, for the erection of the bridges. The work has thus been fairly embarked in, and will, no doubt, be commenced immediately.—*Cumberland Pacquet.*

Sheffield, Ashton under-Lyne, and Manchester Railway.—A meeting of the Board of Directors of the above undertaking was held on Wednesday, the 18th ult., at Penistone, the Right Hon. Lord Wharncliffe in the chair; at which Mr. Vignoles, the eminent engineer of the Company, was instructed to proceed immediately to stake out the line of railway, and prepare for putting the works into active operation. It is expected that the Manchester end of the line, running by Ashton, Hyde, and Mottram, as far as Glossop, will be completed at an early period, by which a large and profitable passenger traffic will be brought upon the railway, whilst the heavier works near the summit are in progress. From the arrangements in contemplation, there is no doubt that the whole of the line will be completed within the time fixed by act of Parliament.

The North Union Railway.—This great undertaking is in rapid progress towards completion, and notwithstanding the many unforeseen and unfavourable circumstances that have, from time to time, retarded the works, the whole line will probably be opened towards the end of August. At the Preston, or north portion of the line, from 120 to 130 men are employed on the bridge, including 40 masons; and not fewer at the cutting beyond the valley of the Ribble. The whole number employed on this part of the line, and at the Preston terminus in Fishergate, and the quarries, &c., may be about 600. Last year, when in full operation, the number engaged on the same ground, averaged from 800 to 850 men; but the works are now considerably narrowed, both in stone work and excavation, so that the same number could not be advantageously employed. Little more than two arches of the bridge now remain to be thrown over. The two on the north side already span, with solid stone, their respective chords; the third is rapidly closing over the centre; the fourth is on both sides considerably above the spring; and the fifth, which is on dry land, will be commenced within a short time; so that the roadway may be available by the period stated, leaving the parapet walls only to be built to complete the whole structure. The "sheeting" planks, or (in Lancashire phrase) the "lagging," has already been removed from the centre on the north side, and the arch stands as firmly as if it were hewn out of the solid rock. The bridge, when finished, and cleared of the vast quantity of timber that now encumbers it, will present a very beautiful and light appearance, notwithstanding the immense weight of the stone, and, when closely viewed, the massy nature of the structure. The Wigan end of the railway is also in a forward state, and the damage occasioned by the flood in autumn last, at Pinnock, is about to be repaired by the construction of a strong wooden bridge.—*Preston Observer.*

Great Western.—It is intended to open the Great Western Railway as far as Maidenhead, a distance of twenty-six miles, on the 1st of June next. The Company have already got upwards of fifty carriages ready for passengers.

The works of the Southampton Railroad are making rapid progress. The first twenty-four miles out of London, being the nearest point on the road to Guildford, will be open to the public on the 14th of May, and upwards of forty miles will be completed early in the autumn.

The London and Birmingham Railway.—On Monday 9th ult., a farther portion of this great line at the London end, and the first portion at the other extremity, were opened to the public. The London train started from the station at Euston-square shortly after seven o'clock in the morning, and arrived at Tring, the former temporary terminus, in somewhat less than two hours. From this point, the line inclines more to the northward, leaving Cheddington and Mentmore to the left. The first three or four miles of the new portion are carried by cuttings to a considerable depth through a loose sandy soil; and thence along a rich agricultural valley to Leighton Buzzard, which is left about half a mile to the right. At this station there is a tunnel of nearly a furlong in length, being the only one which occurs on the newly opened portion of the line. The present terminus is at Denbigh Hall, a little hamlet about two miles beyond Fenny Stratford, on the high road to Stoney Stratford; which is here crossed, at an elevation of about thirty feet, by a lofty and elegant viaduct. The train reached Denbigh Hall at twenty-five minutes past ten—the last stage, 16½ miles long, having been accomplished in fifty minutes. The day was uncommonly fine; and along the line, particularly the newly-opened portion, the crowds were immense, every village and hamlet pouring out its inhabitants, who greeted the novel and extraordinary visitor, as it passed along, with loud and repeated cheering. At Denbigh Hall, the whole population of the surrounding districts appeared to have congregated; and, in default of better accommodation, there being no regular inn or hotel in the neighbourhood, the itinerant vendors of sandwiches, rolls, pies, and other dainties, reaped an abundant harvest. A large tent was erected close to the station, in the event of unfavourable weather; and here the passengers for Birmingham were transferred to coaches and other vehicles, which had been provided

for that purpose. At the Birmingham extremity, the interest excited by the proceedings of the day was, if possible, still more gratifying. The first train started precisely at three minutes past nine, and as it cleared the station, was greeted with hearty cheers by immense crowds of persons who had assembled on every point which could command a view of its progress. At thirteen minutes past nine, the train passed the Yardley viaduct, moving through a beautiful country at a rapid rate—this portion of the line being on an inclination of 1 in 330 inches. Soon after leaving Yardley, a passing view of the village and church of Coleshill was afforded to the left, while the village of Sheldon lay in the valley on the other side. After leaving Sheldon, the train passes Partington, the seat of the Earl of Aylesford. The house or park is not, however, seen from the line, lying at least a mile and a half to the left. At twenty-two minutes past nine, the train crossed under the Coventry turnpike-road, having now accomplished about eight miles of the journey, at the rate of four-and-twenty miles an hour. Passing Bickenhill, which lies to the right, a momentary view is obtained of the spire of the church, as also of the village of Hampton-in Arden. After passing this point, a distant view of the village of Meriden, on a pleasant hill, is obtained to the right, with Barston also on the right. The long embankment of about two miles, after passing Hampton in-Arden, though still on an inclined plane, was crossed with much caution. On reaching the deep cutting at the village of Barkswell, the speed was considerably increased, previous to arriving at which the nearest turnpike-road to Kenilworth is passed, the village, with its celebrated ruins, lying about five miles to the right. After leaving this point, the train proceeds through fertile pastures and well wooded land, and it was not a little amusing to observe the cattle scampering, "tails erect," across the fields, evidently not a little surprised and perplexed at this invasion of their own domain. As the train approached Coventry, numbers of persons lined the embankments on both sides of the road, and the various bridges crossing the line. The train reached the station, eighteen and a quarter miles from Birmingham, precisely in fifty minutes. The station lies to the south side, about a quarter of a mile from the town, at which the train remained six minutes to set down and take up passengers, after which it proceeded on its journey to Rugby. Every elevated point, for two or three miles, from which a view could be obtained, was crowded by multitudes of spectators. The works seem to be progressing rapidly at this portion of the line, where great difficulties had to be overcome, if we might judge from the great depth of the cuttings, and the rocky nature of the ground through which the line runs. From Coventry to Rugby few points of attraction present themselves to the eye of the traveller—"town, village—none are on his track." The general aspect of the country, however, with its rich pasture and undulating land, presents a most pleasing feature, until the train reaches the village of Church Lawton, which lies a little to the right, and a good view of which is obtained from the line. At thirty-two minutes past ten the train reached Rugby, at which place omnibuses and coaches were provided for conveying the passengers to Denbigh Hall. On the return of the trains they were received on entering Birmingham with a salute of twenty-one guns (12-pounders) belonging to the Proof-house. The line may now be said to be open; as passengers are conveyed between Denbigh Hall and Rugby (a distance of about thirty-five miles) by stage-coaches, under a contract entered into by the Company with Messrs. Chaplin and Horne, the eminent coach-proprietors. The line appeared in very excellent order, and was in many parts quite equal to any existing rail way. The stations are nearly complete, particularly the splendid terminus at Birmingham. The buildings here are on a truly magnificent and extensive scale, and when finished will cover an area of about twenty acres of ground. This, however, will comprise a spacious enclosed yard, and stores for warehousing goods, and a large engine-house, capable of holding sixteen engines, with their tenders. At the entrances to this building are two immense tanks, which, when filled, contain two hundred tons of water, supplied by the Birmingham Waterworks Company. There is likewise on this area a beautiful range of booking-offices, with separate waiting rooms at either end, for the passengers by the first and second-class carriages. In addition to these buildings, there is a noble edifice in course of erection at the main entrance to the station, intended as a general office for the meetings of the Directors, and a suite of rooms on the ground-floor, which is set apart for refreshments to the passengers. One of the most striking features at the grand station (which is not more than three parts of a mile from the principal coach-offices and hotels), is the magnificent shedding, supported by elegant pillars, erected by Mr. Joseph Bramah, of Pimlico, the extreme lightness and beauty of which excites general admiration. It is capable of covering not less than sixty carriages, and is built on the same plan as that at the Euston square terminus, but is much more spacious. We understand that the Commissioners of Birmingham intend to clear away several of the narrow and filthy streets in the immediate neighbourhood of the station, forming a grand thoroughfare to the centre of the town; and from the spirit with which the plan is taken up, there is every reason to believe that it will be conceived and executed in a spirit worthy of the body with which it originates, and the great undertaking which called it into existence. To work the seventy miles of road now opened, the Company have already at their command about twenty six powerful engines—a supply of steam power which, there is little reason to doubt, will obviate much of that inconvenience, and prevent many of those accidents, which have marked the working of the Grand Junction line. Availing themselves of the hints which these mishaps have suggested, the Directors have likewise a numerous and effective body of police, who are placed under the direction of an active, experienced, and intelligent superintendent. The men on this establishment have been carefully selected—they are dressed in a green uniform, are remarkably respectful in their behaviour, and are placed along the whole extent of line, almost within hail of each other, so that the slightest obstruction on the rails is immediately detected, and should accident or interruption occur to the trains passing up and down, the intelligence can be conveyed to the next station with a rapidity outstripping even the powers of steam.—*Railway Times.*

ENGINEERING WORKS.

Jetty at Waterloo Bridge.—It is in contemplation by the proprietors of Waterloo Bridge to erect a jetty from the second or third arch of Waterloo Bridge, on the Somerset House side, for the accommodation of passengers who may be desirous of landing there from the steam-boats. The convenience of the plan is obvious, and the public will no doubt avail themselves of the opportunity.

A capacious wet dock is immediately to be constructed a short distance east from the village of Grangemouth. Three hundred labourers will be engaged to execute the work. A number of men are at present employed in deepening the Carron, from Grangemouth to its junction with the Frith, which will afford a safe passage to vessels of any burden. These improvements, when completed, will greatly promote the trade and shipping at Grangemouth, which for some time past has rather been declining.—*Glasgow Constitutional.*

Deal.—It is proposed to erect a commodious pier, for landing and embarking passengers by steam-boats. Sir John Rennie has made a very able report on the project.

Falmouth Harbour.—The inhabitants of this town and neighbourhood having entered into a subscription to deepen the water in the inner harbour at their own expense, measures to accomplish this desirable object (by which means ingress and egress will be obtained at all times of tide for the large class sailing packets and steamers) have been already commenced. The committee of management are about petitioning the Admiralty for the loan of a steam-tug or mud-boat to assist in the undertaking.

Blackfriars Bridge.—The report of the committee was presented to the Court of Common Council on the 13th ult. It stated that the sum of 10,000*l.* was required to prosecute the repairs of the bridge, in addition to the 20,000*l.* already expended in that undertaking, and being part of the 60,000*l.* which the Bank had agreed to advance to the city upon the occasion. The report recommended that the sum required should be granted. Mr. Anderton was very desirous to know whether any one could say when it might be expected the repairs would be completed? He was convinced that a great many felt interested in the matter. Mr. Jones (of Bishopsgate ward) said, in the absence of the chairman, that the committee were doing all in their power to induce the contractor to finish the work, and that the contractor, he believed, was also exerting himself to the utmost. It was, however, impossible to say that the whole undertaking would be perfected before the expiration of a couple of years; for, unfortunately, there was great difficulty in procuring stone adapted to the structure. The court might depend upon the active labours of the committee, the engineer, and the contractor. The report was then agreed to.

NEW CHURCHES.

Staffordshire.—Two new Churches are being built under the sanction of Her Majesty's Commissioners for Churches; one at Upper Gornall and the other at Tifton. Robert Ebbells, Esq., is the Architect for both churches.

Middlesex.—Another new Church is to be built in the parish of Islington, under the joint direction of Messrs. Inwood and Clifton, Architects.

Middlesex.—A new Church is to be erected in Spicer-street, Mile-end New Town, under the direction of T. L. Walker, Esq.

Runcorn New Church.—The sum of 2,800*l.*, we understand, will complete this beautiful and sacred edifice, &c.; and we hope to hear of some good friend to religion and our venerable church establishment enrolling his name among the best benefactors of mankind, by endowing the elegant Gothic structure which is rising into view, to adorn and bless the enterprising little town of Runcorn, with its 8,000 inhabitants. The church is expected to be ready for consecration in the course of two months.—*Manchester Courier.*

PUBLIC BUILDINGS AND IMPROVEMENTS.

The workmen have commenced their labours in Westminster Abbey, preparatory to beginning the arrangements for the approaching coronation of her Majesty, by removing many of the seats and wood-work in the chapel of the Abbey.

Stafford House.—The grand gallery will extend between 300 and 400 feet, and will be a perfect *chef-d'œuvre.* The great banqueting-hall will occupy the whole of the northern side of this mansion, the gallery the eastern, and the drawing-rooms the western and southern. All these apartments will be on the first floor, and it is supposed the mansion will not be finished before the close of the year 1840.—*Morning Post.*

Freemason's Hall.—His Royal Highness the Duke of Sussex, on Wednesday, 11th ultimo, inspected some recent improvements which have been made by Mr. Hardwick, under the authority of his royal highness and the grand lodge of Freemasons, in their splendid hall in Great Queen-street.

Scott's Monument.—The long-continued discussion as to the design of the monument to Sir W. Scott, in Edinburgh, has terminated in favour of the architectural monument by Mr. Kemp, combined with the statue by Mr. Steel, recommended from the first by the sub-committee.

A quadruple row of elms, forming three distinct malls, have just been planted with much taste and judgment at the eastern end of Hyde Park, and will, in a few years, add greatly to the beauty of that favourite resort.

The Royal Exchange.—On Tuesday, April 3, the first day's sale of the materials of the Royal Exchange took place. It produced nearly 2,000*l.* The porter's large handbell, (rung every day at half-past four P.M., to warn the merchants and others that 'Change ought to be closed,) with the handle consumed, valued at 10s. was sold for 3*l.* 3s.; the two carved griffins, holding shields of the city arms, next Cornhill, fetched 30*l*; the two carved griffins, holding shields of the city arms, facing the quadrangle, 35*l.*; the two busts of Queen Elizabeth on the north and south sides, 18*l.*; and the two busts of Queen Elizabeth on the east and west sides, 10*l.* 15s.; the copper grasshopper vane, with the iron upright, was reserved by the committee; the alto-relievo, in artificial stone, representing Queen Elizabeth proclaiming the Royal Exchange, 21*l.*; the corresponding alto-relievo, representing Britannia seated amid the emblems of Commerce, accompanied by Science, Agriculture, Manufactures, &c., 30*l.*; the carved emblematical figures of Europe, Asia, Africa, and America, 110*l.* The sale of the remainder of the materials, &c., it is understood, will take place shortly.

The Nelson Monument.—A meeting was held, March 26, at the Thatched House Tavern, St. James's-street, for the purpose of forming a permanent committee to carry into effect the proposal for erecting a monument to the memory of the great Nelson. Amongst those present were Admirals Fleming, Sir Thomas Hardy, and Sir Thomas Troubridge, Captain Dickenson, Captain Jones, and Captain Codrington. Admiral Sir George Cockburn took the chair, and stated the object of the meeting. He stated that he had received a number of names of influence to form an excellent committee. He should request that Mr. Scott, the secretary, do read the list of those who had consented to attend; and if gentlemen present should, after they had heard the names read, think that any ought to be added, they would be at liberty to propose

them. When the committee had been completed he would say a word about their future chairman. Mr. Scott then read the list, which contained the names of the Dukes of Sussex, Cambridge, Buccleuch, and Hamilton, besides a large number of the nobility and gentry. Among the latter were the names of the Chancellor of the Exchequer, Sir R. Peel, the Sheriffs, and Sir Peter Laurie. After the names of Lord Byron, Sir James Shaw, and others, had been added, the committee was appointed, and the meeting adjourned. The committee have since advertised for designs for this monument, to be sent in, by the 30th of June next. We trust that the profession will come forward to compete for the design in a manner worthy of the occasion ;—*England expects every Architect to do his duty.*

FOREIGN INTELLIGENCE.

A bridge is about to be thrown over the Rhine at Dusseldorf.

Steam Navigation.—The American House of Representatives have voted 100,000 dollars (24,000*l.*) to the heirs of Fulton, the original founder of steam navigation.

The winter palace of the Emperor of Russia is to be rebuilt precisely as it was before, only with some additions that had been proposed and approved by his Majesty, and with some changes in the arrangement of the inner apartments.

Projected Railway in New South Wales.—A company is about to be formed for the purpose of making a railroad from Sydney to Yass, a township on the Morum bidgie river, about 200 miles south-west from Sydney, in the direct line to Port Philip.

Cathedral Church.—A meeting took place at Sydney the 24th October, the Bishop of Australia in the chair, when 4,000*l.* towards the building of a cathedral church at Sydney was subscribed. It was supposed that at least 20,000*l.* would be available for this purpose.—*Australian Papers,* Nov. 9th.

America.—A great design is on foot by the New York legislature, to authorize a loan of 28 millions to prosecute the works of internal improvement now in progress. If such a measure passes, the moneyed men here will have a fine field for the exercise of their philanthropy.—*Morning Herald.*

The King of Greece has appropriated a sum of 120,000 drachmas to the construction of a new lazaretto at Syra, of sufficient magnitude to contain convenient accommodation for upwards of 200 persons, each having a separate lodging. It will be composed of two buildings, comprising magazines, apparatus for fumigation, baths, &c., and a residence for the inspector.

Steam Engines.—The governor of Milan has issued a notice, dated the 18th of January, stating that an imperial decision of the 25th November, 1837, has fixed for the present the duty upon the importation of steam-engines necessary for the government railroads, at 1 per cent. This duty will be afterwards increased 1 per cent. every following year, until it reach 5 per cent. This decision, however, is not to prejudice the arrangement that every machine unknown in the kingdom, and imported for the first time, is to be exempt from all duty. This decision entered into execution on the 1st January, 1838, and the duty is paid exclusively at the principal custom house.—*Mining Journal.*

Belgium.—Besides the theatre at Ghent, which is now in progress, and will, when completed, be an exceedingly spacious edifice, Roelandt, one of the most eminent architects in Belgium, is engaged upon several other buildings, among which are the new Depôt for merchandise, and Palace of Justice at Antwerp, and the Town-house at Awst.

Milan.—Voghera, of Milan, already known to the public by his work on the Antiquities of Pavia, is about to bring out a splendid publication illustrative of the Arco della Pace at Milan, erected from the designs of the late Marchese Cagnola, and after the Barriere de l'Etoile at Paris, one of the most stupendous monuments of its class in modern times.

Railroad from Strasburg to Basle.—We learn from Alsace that the railroad from Strasburg to Basle has been commenced with great spirit; a considerable portion of the land has been purchased; some of the embankments are far advanced, and everything leads to a fair expectation that this line will be completed before its rival, on the other side of the Rhine, is begun, notwithstanding the vote of the chambers of Baden.

Subterranean Travelling.—The line of railway between Lyons and St. Etienne, the largest manufacturing town and richest coal district in France, is only thirty-four miles in length; yet such is the unevenness of the country, and so great has been the anxiety of the engineers to preserve as complete a level as possible, that there are actually no less than twenty tunnels between the two termini! One of these is a mile in length, while another, which is half a mile in length, is carried under the bed of a river which crosses the line.—*Mechanic's Magazine.*

Internal Navigation of France.—The committee charged to examine the bill relative to this subject, will soon finish its work. Of four canals proposed by government, the committee have adopted two—that from the Marne to the Rhine, and that along the banks of the Garonne. They are both considered by the committee as political and international lines. The first will complete the navigation from Havre to Strasburg, and will ensure the circulation of produce from many departments in the east whose manufacture and commerce have no outlet. This line is the most important to France, as the German Powers are occupied with the junction of the Rhine and Danube, which, by means of a projected canal, will open a communication between the Atlantic and the Black Sea. The second of these canals, in effecting the junction of the Mediterranean and Atlantic, will ensure, in case of a maritime war, great advantages to the south of France.—*French paper.*

French Railroads Bill.—The committee on this bill has come to a conclusion unfavorable to the plan of confiding to the government the execution of any other than the great lines; and has recommended that even those shall in preference be intrusted to private companies, unless the latter decline to undertake them. This decision of the committee was adopted by a considerable majority, on the ground of the delay likely to attend the execution of the lines by government, and also on account of the considerable expense in which the ministerial system would involve the chamber.—*Paris paper.*

STEAM NAVIGATION.

The "Great Western" Steam Ship.—This superb vessel left her moorings at Blackwall, on her voyage to Bristol, at eight minutes past six on Saturday morning, March 31, and at twenty-two minutes past seven passed Gravesend, the engine working beautifully, and the progress of the vessel highly satisfactory. At a quarter past eight o'clock a strong smell of burning oil was perceived to arise from the felt clothing of the upper part of the boilers, which soon after took fire, and from the quantity of dense smoke arising from it caused much apprehension; it was, however, soon extinguished by the powerful means on board of supplying a large stream of water. The vessel having during this time been brought to, off Leigh, an examination took place by Messrs. Maudsley and Field, who were on board, who found that the workmen had improperly felted the boilers close up to the base of the chimney, and that the composition of oil and red lead with which the felt was stuck on, had consequently fired, smoked, and finally burst into flame. The origin of this unpleasant occurrence having been thus satisfactorily ascertained, all further cause of alarm was allayed by its immediate removal. Neither boilers nor engines had sustained the slightest injury. The vessel remained on the Chapman Sands until the flood tide lifted her, when she proceeded on her voyage, and arrived in the port of Bristol about six o'clock on the following Monday evening, having completed her voyage round from London, being 670 miles, in 58½ hours, 6½ of which she was detained by her accident, thus clearing very nearly 13 miles per hour. She came to an anchor opposite the Battery, at the river's mouth. She started from Bristol on Monday morning the 8th ult., with but few passengers. We understand that several who had paid their passage, forfeited the fare when they heard of the accident described above.

On Saturday morning, March 31, at nine o'clock, a new steam-boat, called the "Falcon," belonging to the Eagle Steam-boat Company, made its first trip from Waterloo-bridge to Blackwall and Gravesend.

Two more large steamers are to be built at Chatham dock-yard. They are to be the same size as the Hydra, now constructing in one of the docks of that yard.

The "Royal Adelaide."—We lately had the gratification of visiting one of the finest and largest steam-vessels that ever floated at our quays. She is the property of the City of Dublin Steam Packet Company. The "Royal Adelaide" was launched a few weeks since. We examined minutely every portion of this vessel's nautical architecture, and we can safely affirm that we never saw strength and solidity so beautifully combined with purely artistical taste as we found exemplified in the Royal Adelaide. Her engines are 300 horse power, having the advantage of every modern improvement in steam science; her build combines strength and security. The principal saloon is elegant, airy, and roomy, the private cabins are remarkably convenient, and the splendid manner in which they are furnished would surprise any one unacquainted with the style in which passenger vessels are now fitted up. The arrangements for cargo, for carriages, horses, &c., are also most excellent. She is placed on the Belfast, Dublin, London, Falmouth, and Plymouth station, and her first voyage has been unprecedentedly quick.—*Belfast Northern Whig.*

It is said that the directors of the London and Westminster Steam-boat Company, in order to test the plan so strenuously supported by Captain Basil Hall, have ordered one of their vessels to be fitted up with the wheel at the head instead of the stern.

The iron vessels building on the Clyde, and just on the eve of launching, possess strength, safety, and speed, in a greater degree than those of timber hitherto in use, by being divided into five sections, with partitions as strong as the sides of the vessel; they will not only be safer as regards fire, but in the event of striking on a rock or in collision with another ship; for although one or two of the sections were cut and filled with water, those remaining would maintain the vessel afloat. They are made so as to arrive or depart at even low-water at Glasgow; and should they be employed in the Liverpool trade, the communication between that port and Glasgow *via* the Birmingham Railway will not exceed 30 hours.

Starting of the "Sirius," Steam Packet for New York.—At a few minutes after ten o'clock on Wednesday, April 4, the "Sirius" left Cork and proceeded on her voyage, having on board thirty state cabin, twenty-nine fore cabin, and thirty five steerage passengers; accompanied by the "Ocean" steam-packet, which vessel proceeded to the harbour's mouth, to bring back those ladies and gentlemen who remained on board to see their friends to sea. It is expected to make the voyage in twelve days. The "Sirius" is the property of the St. George Steam Packet Company, and was chartered by them to the British and American Steam Navigation Company. It is intended to make two more voyages to America, until the "British Queen," their splendid new vessel, is ready. We understand the "Sirius" will leave New York on the 1st of May.

We understand that a company has been started in Liverpool, under the name of the "Liverpool and New York Steam Navigation Company," who propose to build steam-ships for the purpose of running between Liverpool and New York.—*Liverpool Standard.*

Two fine steam-packets are to run this summer between Rye and Boulogne. They will sail more than ten miles an hour; the voyage will be performed in about three hours and a half.

Glasgow.—A beautiful steam-ship named the "Tarbert Castle" was launched on the 13th ultimo at Messrs. Hedderwick and Rankin's building-yard, near the Broomielaw quay.

The Clyde.—The competition in the steam navigation on the Clyde this season bids fair to be of rather an animated description, from the number of steamers that are making their *debut* for carrying passengers to and from the various watering-places on the coast. A splendid new steamer, the "Argyle," has been built by Mr. Robert Duncan, ship-builder, Greenock, who has devoted himself to the perfecting of the models of river steamers. From the power of her engines, the "Argyle" will be one of the best and swiftest conveyances to Lochfine. No cost has been spared in the fitting-up of the cabins.

Plan for preventing Concussion with Waggons on Railroads.—Mr. R. Ayre, of the Bridge End, to whose ingenious inventions, connected with railroads, we have had frequently much pleasure in calling the attention of our readers, has communicated to us a plan for preventing concussion of the waggons or carriages, on the sudden stoppage of a train. This plan consists of a *cleet* on the one carriage, say the carriage before, and a curved iron, something like a coach-spring, which by coming under the cleet will brake or stop both the fore and hind wheels, the connexion of the cleet and the curve causing brakers at the other end of the curved iron to produce that effect. The result with a long train must naturally be such as to render the expensive *buffers,* at present employed, comparatively useless.—*Tyne Mercury.*

PARLIAMENTARY PROCEEDINGS.

House of Commons.—List of Petitions for Private Bills, and progress therein.

Those marked thus — are either withdrawn or rejected.

	Petition presented	Bill read first time.	Bill read second time.	Bill read third time.	Royal Assent.
Aberbrothwick Harbour	Feb. 12.	—	—	—	—
Anti Dry-rot Company	Dec. 7.	Feb. 26.	—	—	—
Ardrossan Railway	Feb. 16.	—	—	—	—
Belfast Waterworks	Dec. 21.	Apr. 6.	..	..	..
Birmingham Equitable Gas	Feb. 16.	Mar. 2.	—	—	—
Birmingham, Bristol, and Thames Junction Railway	Feb. 16.	Mar. 26.	..	..	..
Blackburn Gas	Feb. 14.	Mar. 8.	Mar. 22.	..	..
Bolton and Preston Railway	Feb. 15.	Mar. 14.	..	..	..
Boughrood (Wye) Bridge	Feb. 14.	Mar. 26.	..	..	..
Brandling Junction Railway	Jan. 16.	Feb. 14.	Mar. 20.	Apr. 25.	..
Bristol and Exeter Railway	Feb. 12.	Mar. 21.	Apr. 3.	..	..
Bury (Lancaster) Waterworks	Feb. 13.	Mar. 15.	Mar. 30.	..	..
Bude Harbour	Mar. 30.	..	..	..	..
Cheltenham and Great Western Union Railway	Dec. 15.	Feb. 20.	Feb. 27.	Mar. 28.	..
Cookham Bridge	Feb. 15.	Mar. 8.	Mar. 20.	Apr. 25.	..
Deal Pier	Feb. 16.	Mar. 26.	..	..	..
Eastern Counties Railway	Jan. 25.	Feb. 26.	..	..	..
Edinburgh and Glasgow Railway	Jan 25.	Mar. 2.	Mar. 13.	..	..
Exeter Commercial Gas	Feb. 16.	Mar. 26.	..	..	..
Farringdon (London) Street	Feb. 5.	Mar. 26.	..	..	..
Fen Drayton (Cambridge) Enclosure	Feb. 14.	—	—	—	—
Fishguard Harbour	Feb. 9.	Feb. 23.	Mar. 12.	..	..
Fleetwood Tontine	Feb. 15.	Mar. 26.	..	..	..
Garnkirk and Glasgow Railway	Feb. 13.	Mar. 26.	Apr. 25.	..	..
Glasgow Waterworks	Feb 2.	Feb. 26.	Mar. 16.	..	..
Grand Junction Railway	Feb. 12.	Mar. 8.	Mar. 29.	..	..
Gravesend Cemetery	Feb. 14.	Mar. 21.	Apr. 3.	..	..
Gravesend (No. 1) Pier	Jan. 25.	Feb. 7.	Feb. 26.	..	..
Gravesend (No. 2) Pier	Feb. 16.	Mar. 26.	..	..	..
Great Central Irish Railway	Feb. 26.	Apr. 3.	..	..	..
Hartlepool Dock and Railway	Feb. 16.	Mar. 26.	..	..	..
Herne Gas	Feb. 16.	Mar. 26	..	..	..
Isle of Thanet Cemetery	Feb. 14.	Mar. 26.	..	..	..
Lady Kirk and Norham (Tweed) Bridge	Feb. 16.	Mar. 26.	..	..	..
Leamington Priors Gas	Feb. 16.	Mar. 26.	April 26.	..	..
Leicester Gas	Feb. 16.	Mar. 26.	..	..	..
London and Croydon (No. 1) Railway	Dec. 22.	Feb. 23.	Mar. 7.	April 4.	..
London and Croydon (No. 2) Railway	Dec. 22.	—	—	—	—
London and Greenwich Railway	Dec. 11.	Feb. 7.	Feb. 20.	Mar. 21.	Apr 11.
London Grand Junction Railway	Feb. 15.	Mar. 26.	..	..	..
Londonderry Bridge	Nov. 27.	Mar. 5.	..	..	..
Manchester, Bolton, and Bury Canal, &c.	Jan. 23.	Feb. 19.	Mar. 8.	..	..
Metropolitan Suspension Bridge	Feb. 16.	Mar. 26.	..	..	..
Midland Counties (Mountsorrel) Railway	Feb. 8.	Mar. 16.	Mar. 29.	..	..
Montgomeryshire Western Branch Canal	Jan. 16.	Feb. 27.	—	—	—
Moy River (Ireland) Navigation	Feb. 13.	—	—	—	—
Necropolis Cemetery	Dec. 14.	Feb. 12.	Feb. 20.	..	..
Newcastle-upon-Tyne Railway	Dec. 4.	Feb. 9.	Mar. 6.	..	..
Newcastle-upon-Tyne and North Shields Railway	Feb. 14.	—	—	—	—
Newquay (Cornwall) Harbour	Feb. 13.	Mar. 26.	..	..	..
Newtyle and Cupar Angus Railway	Feb. 13.	Mar. 26.	April 25.	..	..
Oldham Gas and Waterworks	Feb. 13.	Mar. 8.	April 2.	..	..
Oxford and Great Western Union Railway	Feb. 16.	Mar. 7.	Mar. 14.	..	..
Paington Harbour	Dec. 7.	Dec. 22.	Jan. 16	Feb. 28.	Mar. 30.
Portland Cemetery	Feb. 16.	—	—	—	—
Portsmouth Floating Bridge	Feb. 15.	Mar. 8.	Mar. 26.	..	..
Rochester Bridge	Feb. 14.	Mar. 19.	April 3.	..	..
St. Helen's and Runcorn Gap Railway	Feb. 15.	Mar. 16.	Mar. 30.	..	..
St. Philip (Bristol) Bridge	Feb. 16.	Mar. 26.	..	..	..
Saltash Floating Bridge	Dec. 21.	—	—	—	—
Soane's Museum	Feb. 12.	—	—	—	—
Southampton Docks	Feb. 14.	Mar. 29.	..	..	..
Southampton Pier	Feb. 9.	Mar. 26.	..	..	..
Sudbury Waterworks and Improvements	Feb. 16.	—	—	—	—
Swansea Harbour	Feb. 12.	—	—	—	—
Taw Vale (Devon) Railway and Dock	Feb. 15.	Mar. 12.	Mar. 26.	..	..
Tenby Improvement and Harbour	Jan. 23.	Feb. 9.	Feb. 26.	Apr. 3.	..
Thames Improvement Company and Drainage Manure Association	Dec. 4.	Feb. 16.	..	..	..
Thames Purifying Company	Feb. 16.	—	—	—	—
Turton and Entwisle Reservoir	Feb. 13.	Mar. 8.	Mar. 21.	..	..
Tyne Dock	Feb. 16.	—	—	—	—
West Durham Railway	Feb. 16.	—	—	—	—
West India Docks	Feb. 15.	Mar. 22.	Apr. 9.	..	..

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH MARCH, AND THE 26TH APRIL, 1838.

JULIUS JEFFREYS, of Kensington, in the County of Middlesex, Esquire, for "Improvements in Stoves, Grates, and Furnaces."—24th March; 6 months.

JOHN CLARK, the Younger, of Mile End, Glasgow, Cotton Spinner, for "Improved Machinery for Turning; some Part or Parts of which may be made applicable to other useful Purposes."—4th April; 6 months.

WILLIAM ANGUS ROBERTSON, of Peterborough Court, Fleet Street, in the City of London, Patent Agent, for "Certain Improvements in the Manufacture of Hosiery, Shawls, Carpets, Rugs, Blankets, and of other Fabrics. Communicated by a Foreigner residing abroad."—4th April; 6 months.

GEORGE BARNETT, of 40, Jewin Street, in the City of London, Tailor, for "An improved Button, for protecting the thread or shank from friction and wear."—7th April; 2 months.

JOSEPH ROCK COOPER, of Birmingham, Gun Maker, for "Improvements in Fire Arms."—10th April; 6 months.

THOMAS WATSON, of Addle Hill, Doctors' Commons, in the City of London, Mechanist, for "Improvements in Stoves."—10th April; 6 months.

DAVID REDMUND, of Wellington Foundry, Charles Street, City Road, in the County of Middlesex, Engineer, for "Certain Improvements in the Construction and Apparatus of Steam Boats or Vessels used for War or Commercial Purposes."—10th April; 6 months.

EDWARD COBBOLD, of Long Melford, in the County of Suffolk, Clerk; and PETER RICHOLD, the Younger, of the same place, Coach Maker, for "Improvements in the Manufacture of certain Pigments or Paints, or such like Substances."—10th April, 6 months.

WILLIAM FOTHERGILL COOKE, of Breede's Place, Hastings, Esquire, for "Improvements in giving Signals and sounding Alarms at Distant Places, by means of Elastic Currents transmitted through Metallic Circuits."—18th April; 6 months.

WILLIAM BARNETT, of Brighton, Iron Founder, for "Certain Improvements in the Production of Motive Power."—18th April; 6 months.

THOMAS MURRAY GLADSTONE, of Bootle-cum-Linacre, near Liverpool, Chain Cable and Anchor Manufacturer, for "Certain Improvements in Ships' Windlasses, which Improvements are applicable to other Purposes."—21st April; 6 months.

EDWARD COOPER, of Haverton, in the County of Wilts, Clothier, for "An Improvement in the Making or Manufacturing of Soap."—21st April; 6 months.

JAMES TIMMINS CHANCE, of Birmingham, Glass Manufacturer, for "Improvements in the Manufacture of Glass."—21st April; 6 months.

JAMES MACNED, Coach Maker, George Street, Edinburgh, for "An Improvement or Improvements in Carriages."—21st April; 2 months.

MOSES POOLE, of the Patent Office, Lincoln's Inn, in the County of Middlesex, Gentleman, for "Improvements in Manufacturing Carpets, Rugs, and other Napped Fabrics. Communicated by a Foreigner residing abroad."—21st April; 6 months.

CHRISTOPHER NICKELS, of York Road, Lambeth, Manufacturer, for "Improvements in Machinery for Recovering Fibres, applicable to the Manufacture of Braid and other Fabrics."—21st April; 6 months.

ROBERT FINLAYSON, of Regent Street, Cheltenham, in the County of Gloucester, M.D., for "Improvements in Harrows."—21st April; 6 months.

FRANCIS POPE, of Wolverhampton, in the County of Stafford, Fancy Iron Worker, for "Certain Improvements in Machinery for Making or Manufacturing Pins, Bolts, Nails, and Rivets, applicable to various useful Purposes."—24th April; 6 months.

THOMAS VAUX, of Woodford Bridge, in the County of Essex, Land Surveyor, for "Improvements in Tilling and Fertilizing Land."—24th April; 6 months.

SAMUEL WAGSTAFF SMITH, of Leamington Priors, in the County of Warwick, Iron Founder, for "Improvements in Regulating the Heat of Furnaces for Smelting Iron," which Improvements may also be applied to retorts for Generating Gas.—24th April; 6 months.

ALEXANDER HAPPEY, of Basing Lane, in the City of London, Gentleman, for "A New Composition applicable to Paving Roads, Streets, Terraces, and other places, which Improvements are also applicable to the different Purposes of Building, and also in the Apparatus for making the said Composition. Communicated by a Foreigner residing abroad."—25th April; 6 months.

RICHARD GOODWIN, of St. Paul's Terrace, Camden Town, in the County of Middlesex, Coal Merchant, for "An Improved Prepared Fuel."—26th April; 6 months.

NOTICES TO CORRESPONDENTS.

The first communication of R. E. did not come to hand; the second was received too late for notice in our last month's Journal.

We have been obliged to postpone, till our next number, the paper by Philotechnicos, the Antiquarian, a description of Collier's Patent Boiler, and some other communications, in order to clear off our arrears.

The next month's Journal will contain a description and drawings of the Blind Asylum; including the apparatus for warming, cooking, washing, &c.—the whole forming, we hope, a very interesting paper.

We have not received any Drawings explanatory of the *New Invented Steam-Engine*, described in our Journal for March last; the paragraph was copied from a Birmingham Paper.

ERRATA IN LAST NUMBER.

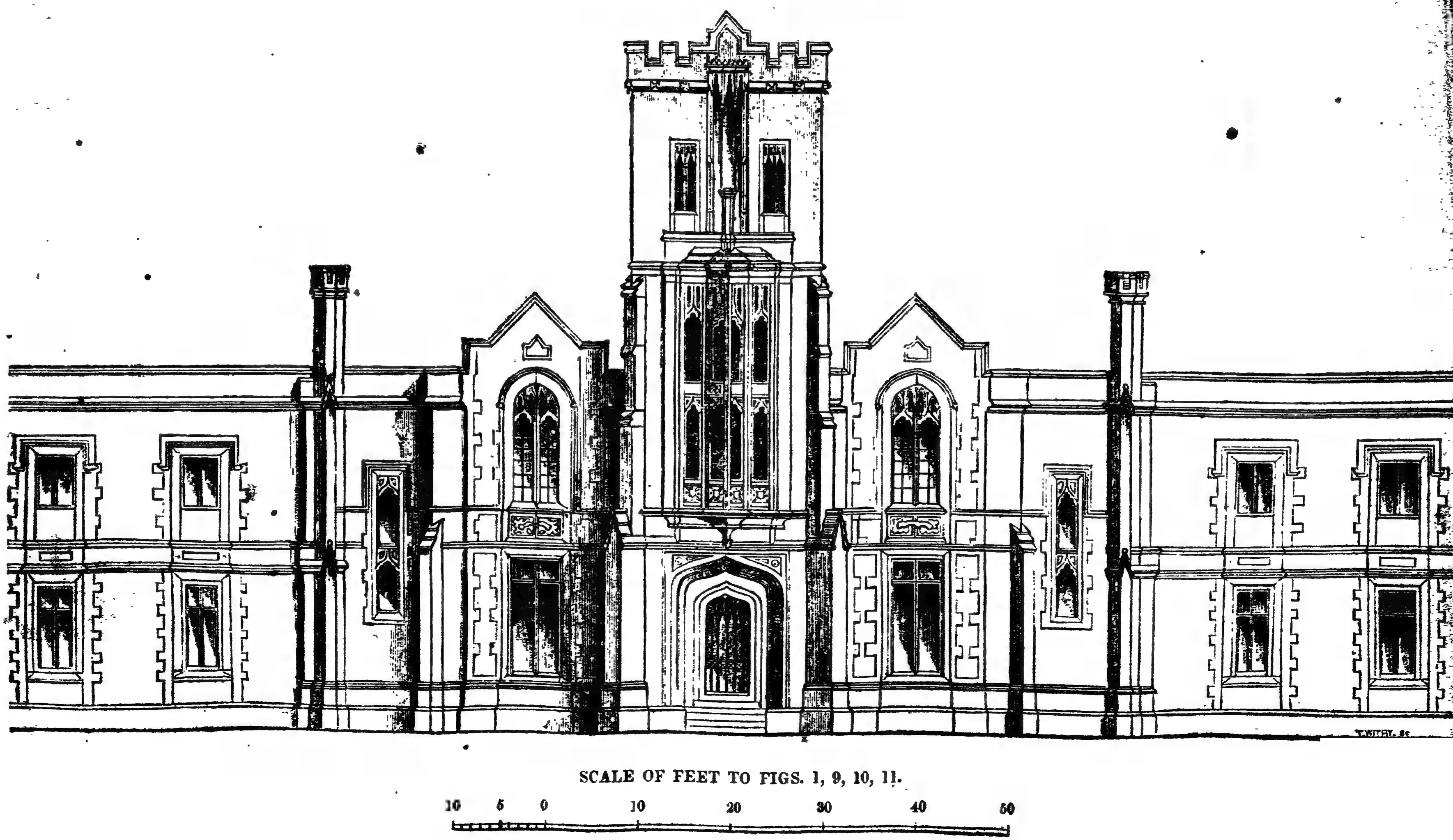
Page 156, col. 2, line 21, for *spriral*, read *spiral*.
" " " for *extends*, read *compresses*.
" " line 22, for *collapses*, read *extends*.
Page 157, col. 2, line 26, for *Callcciates*, read *Callicrates*.
" " " for *Ninesicles*, read *Mnesicles*.
Page 161, col. 1, line 39, for *sail*, read *soil*.
" col. 2, line 2, for *gradient*, read *gradients*.
" " line 63, for *five*, read *eight*.

SCHOOL FOR THE INDIGENT BLIND,

ST. GEORGE'S FIELDS.

JOHN NEWMAN, Esq., F.S.A., ARCHITECT.

FIG. 1.—ELEVATION OF THE CENTRE BUILDING.



SCHOOL FOR THE INDIGENT BLIND.

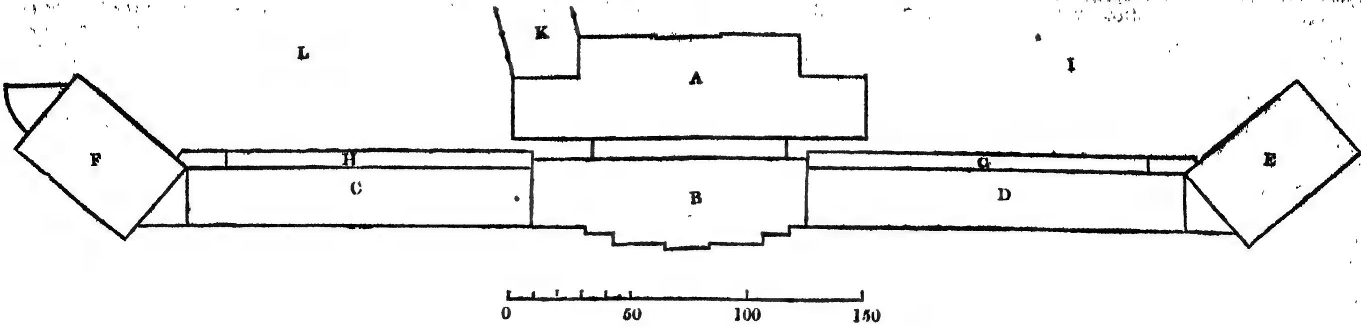
Although this building has attracted very little attention,—has in fact scarcely been mentioned in any way by those who have spoken of contemporary productions of our metropolitan architecture,—it has some claim to notice, if merely on account of its great extent, in which respect it falls very little short of its neighbour, Bethlehem Hospital; its extreme length on the line comprising the fronts of the wings being 550 feet, while that of the other is 569. Whether this silence may not be in some degree attributable to its *out-of-the-wayness* from any fashionable quarter of the town, we pretend not to decide; but certain it is that the building itself does not deserve it. This we think will be allowed even by those whom our wood-cuts now make acquainted with it for the first time; although they show its elevation piece-meal, nor pretend to do justice to the ornamental details, which have not been so carefully attended to as we could wish. We think it but right to state this, lest any inaccuracies and want of spirit observable in the cuts should be imputed to the building itself; and also lest, so judged of, it should not be thought to warrant our favourable opinion of it. There is certainly much happiness of effect as well as novelty, in the diagonal position of the wings, whose fronts, in consequence of being turned thus obliquely, display themselves to greater advantage than they otherwise would do, and at first sight produce an apparent irregularity by no means disagreeable. Their elevations, which are pleasing and in good taste, appropriate in character, simply but judiciously decorated, serve as a counterpoise to the tower and central compartment of the principal or North front, and thus bring the whole into keeping. The abovementioned division of the longer façade is quite of a piece with the end elevations, but treated with greater importance, and on an extended scale. It is exceedingly well composed, and detaches itself effectively from the general line of building, both in its plan and elevation; and owing both to the variety of its outline, and the bold projection of its buttresses, shows itself to advantage even when quite in shade, and before it receives the sparkling lights on its projecting surfaces ere the sun shines fully upon it,—which is only at this season of the year. Yet although there is no want here either of variety or suitable ornament, there is a pleasing degree of unity and soberness. It is full, without being crowded and crammed; and regular, without being formally or monotonously so; for which it is in no small degree indebted to the two staircase windows, which differing so much from the others both in their proportions and position, occasion what may be termed a symmetrical irregularity, the irregularity relatively to one side alone, being counterpoised by the same irregularity in a corresponding situation on the other side of the centre. The rest of this front is treated quite subordinately to its centre, yet not so as to clash violently with it, but rather in such manner as to give it full effect. Did the design terminate with these lateral parts, then indeed the centre tower might be considered somewhat too ornamental, and too strongly marked; but as we perceive that its character is resumed in the front of the wings, the objection that might otherwise arise is obviated. The exterior of the building is of white brick, with Park spring stone dressings and ashlar coins to the windows, and the tower, bay windows, and gateways, are entirely of the latter material. It was erected from the designs of J. Newman, Esq., the architect of the Roman Catholic Chapel, Finsbury Circus.

We hope that the plans of the building which we have given, aided by the explanatory references appended to them, will render the general arrangement of the various parts intelligible. The block plan of the ground floor will show the size and general form of the building; while the enlarged drawings of the centre and wings on both floors, will exhibit the disposition of the rooms in them. We will now give a glance over the whole interior of the edifice on both floors, noticing particularly the principal rooms, and whatever seems most to deserve attention. But first we must observe, generally, of the interior, that it corresponds well in style and character with the exterior; while no unnecessary or superfluous ornament has been introduced, we detect nothing of niggardliness in the design or want of solidity in the execution. The general arrangements are well adapted to the purposes of the establishment, and calculated not solely for its present extent, but for its prospective enlargement. And the whole has been constructed in so substantial a manner, as to promise to be a lasting monument to the munificence of the supporters of the Institution.

On the *first floor* in the centre, is the Chapel or Music room A, fig. 6; it is divided into four compartments by archways which support the tower. In the centre compartment to the front, immediately under the tower, is placed the Organ; on each side of which are ranged seats for the inmates of the establishment. The remainder, forming the largest compartment, is occupied by seats for the public; and in the centre, opposite the organ, is placed the reading desk. The ceiling is flat, formed into panels by moulded ribs with bosses at their intersections, the ends next the walls resting on brackets supported by corbels. The whole is grained in imitation of oak, and has a very pleasing effect, harmonizing well with the character of the building. Adjoining the chapel, are rooms for the linen or wardrobe; and bed rooms for the assistants who are in charge of the dormitories at night. The Dormitories occupy the whole length of the building over the work rooms D and C, as shown in the block plan fig. 2; and more at large at E, figs. 6 and 7, and M, figs. 6 and 8. They attract the eye of the visitor, as remarkable for their large size, and light and airy appearance. Additional height is gained by taking in part of the roof, which is ceiled as shown in fig. 9. The walls are not plastered, but the brick-work is worked fair and coloured; and a stop or fillet is nailed all round the floor and scribed to the walls instead of skirting. The beds are arranged in a double row, divided at the head by a quarter partition boarded on both sides, and about five feet high, running along the centre of the room. A section of this division will be seen in fig. 9; as also one of the iron rods rising to the roof, by which it is kept steady in its place. This arrangement of the beds, we consider admirable, as placing them out of the reach of the draft from the windows. In the Western Wing at the end, are two more dormitories for the boys; and also Linen rooms. In the Eastern Wing is a suite of apartments for the Superintendent of the institution. It contains also two smaller dormitories for the girls; and the girls' Washing room fitted with numerous washing basins, each furnished with a supply of water, and a waste pipe and plug.

On the *ground floor* is the Kitchen, N, fig. 3; most appositely placed between the two dining rooms O and P. It is spacious and lofty; and lighted from the top by a Lanthorn light, the position of which is shown by the dotted parallelogram in the centre, fig. 3, and its form is exhibited in the section, fig. 10. It is furnished with sculleries, R R, one on each side, and all requisite offices. The cooking apparatus is of the best construction, and on a scale adequate to the magnitude of the demands upon it in so large an establishment. It was planned and executed by Mr. Stephen, of Great Russell-street. On the side next to the girls' dining room, O, fig. 3, are placed the roasters, &c., in a recess built for their reception. They will be seen in fig. 10; but very imperfectly, owing to the smallness of the scale. The two side compartments are fitted with Rumford's roasters, heated by the fires of the stewing stoves which occupy the centre compartment. Of these stoves there are three, the middlemost being used when the roasters are not required. In a corresponding recess on the opposite side of the kitchen, stands the range, furnished with back boiler for the supply of hot water to the scullery and kitchen. Over the range is a smoke-jack; and on each side are copper boilers. The Dining rooms, O and P, fig. 3, are furnished with a double row of tables and benches running lengthwise along the rooms; to these are added in the boys' room, P, a supplementary single row along the back wall, with a carver's table in the corner. The remaining portion of the centre building, is occupied by the Hall, Committee room, and apartment of the Matron and Assistants, who are thus advantageously placed for the exercise of control and superintendence over the whole establishment. Adjoining the centre building are the Work rooms: that for the boys is on the right; it is 165 feet long, 25 wide, and 15 high: that for the girls is on the left; it is 147 feet long, corresponding in its other dimensions with the boys' room. The walls of these rooms are not plastered, but finished as described above in the case of the dormitories. In the Wings at each end, there are smaller work rooms; and entrance gateways leading to the grounds. That on the left contains also a counting-house, and a warehouse; and adjoining is the shop, for the sale of the various articles manufactured by the inmates. In the right-hand Wing we find also the boys' Washing room, Y, fig. 5, which exhibits much ingenious contrivance. Round the room are arranged pewter washing basins, each fitted with a supply pipe, and a waste pipe with moveable plug. Along the room are fixed two long tables, with drawers to hold the boys' dressing apparatus: at each end is a large towel mounted on a roller, which is set transversely to the tables and supported by long iron rods. Between these tables is situated a long double trough for feet-washing, with seats on each side between it and the tables. A board about three inches wide and guarded by ledges, runs along the whole length in the middle, and serves as a common soap dish for both divisions of the trough. This trough is of wood, lined with lead; it is supplied with cold and hot water, the latter from the furnace in the adjacent room S. The water is carried off by waste pipes in the bottom, fitted with plugs. The Play-grounds L and I, fig. 2, will when cleared and levelled, be ample in size, and in every respect adapted to their important purpose;—important, as the blind are generally found to need all possible inducements to take the requisite quantity of exercise. The long covered walks, G and H, are likewise admirably suited for places of exercise in wet weather. Their roofs are supported by elegant iron brackets let into the walls, as shown in fig. 9.

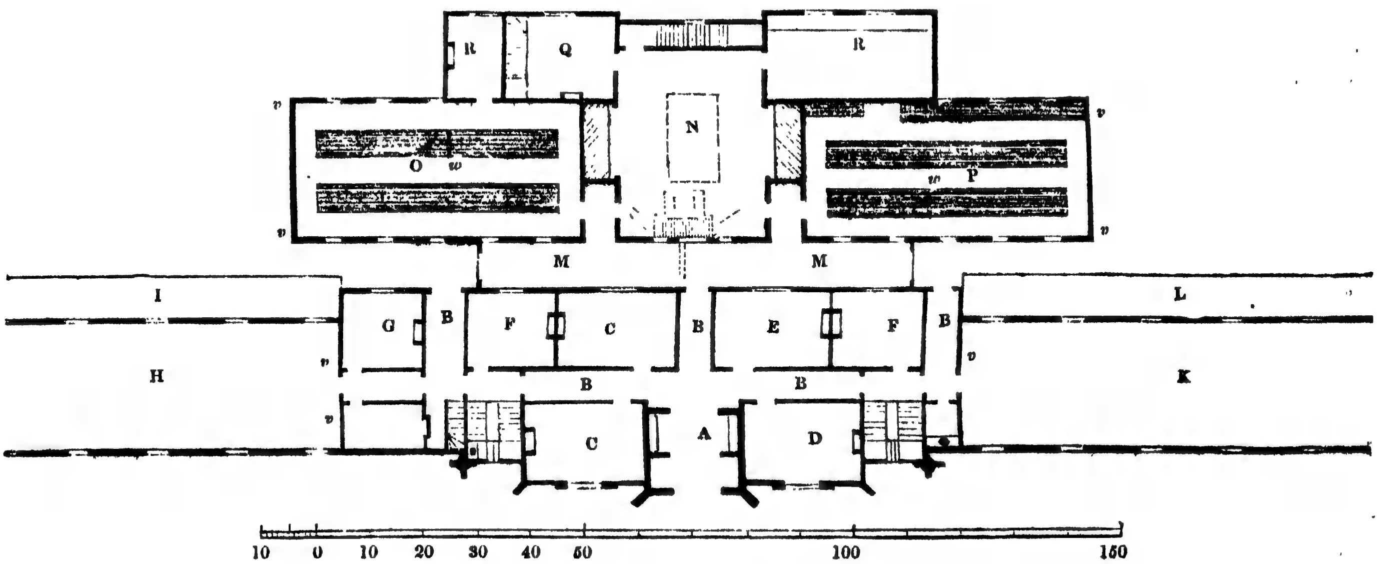
FIG. 2.—BLOCK PLAN OF GROUND FLOOR.



Scale of Feet to Fig. 2.

A, Centre Building back, containing Kitchen, &c.—B, Centre Building front, containing Hall, &c.—C, Girls' Work-room.—H, covered walk.—F, Eastern Wing.—L, Girls' Play ground.—D, Boys' Work room.—G, covered walk.—E, Western Wing.—I, Boys' Play ground.—K, separation between Play grounds.

FIG. 3.—PLAN OF GROUND FLOOR, CENTRE BUILDING (B, Fig. 2).



Scale of Feet to Figs. 3—8.

FIG. 4.—PLAN OF GROUND FLOOR, EASTERN WING (F, Fig. 2).

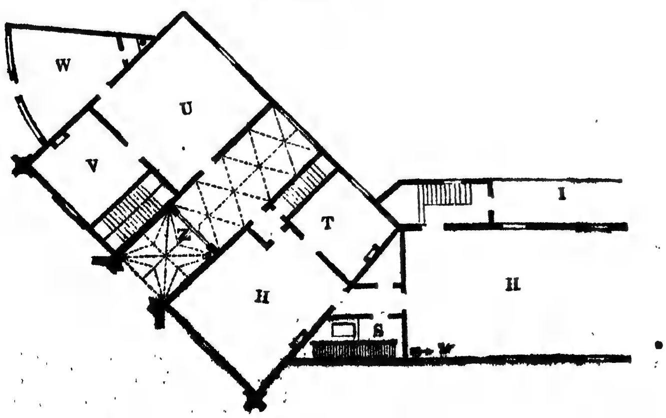
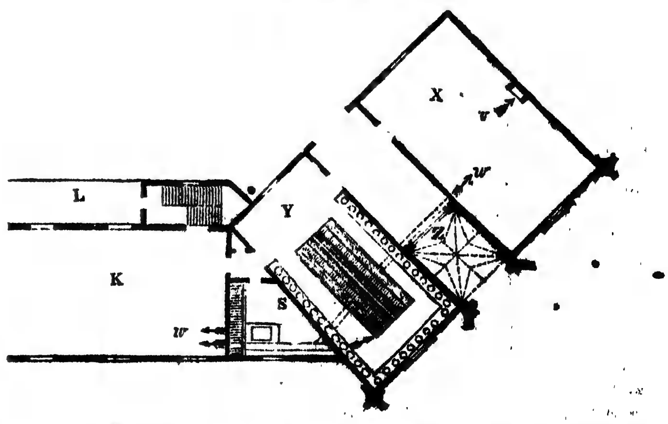


FIG. 5.—PLAN OF GROUND FLOOR WESTERN WING (E, Fig. 2).



A, Hall.—B, B, &c., Passages.—C, C, Parlours.—D, Committee room.—E, Bed-room.—F, F, Assistants' rooms.—G, Matron's room.—H, H, Girls' Work rooms.—I, Girls' covered walk.—K, Boys' Work room.—L, Boys' covered walk.—M, M, Passage between front and back centre building, with doors at each opening into the Play grounds.—N, Kitchen.—O, Girls' Dining room.—P, Boys' Dining room.—Q, Servants' room.—R, R, Sculleries.—S, S, Furnace rooms.—T, Assistant Matron's room.—U, Warehouse.—V, Counting house.—W, Shop.—X, Shoe makers' room.—Y, Boys' Washing room.—Z, Z, Gates.

FIG. 6.—PLAN OF FIRST FLOOR, CENTRE BUILDING (B, FIG. 2).

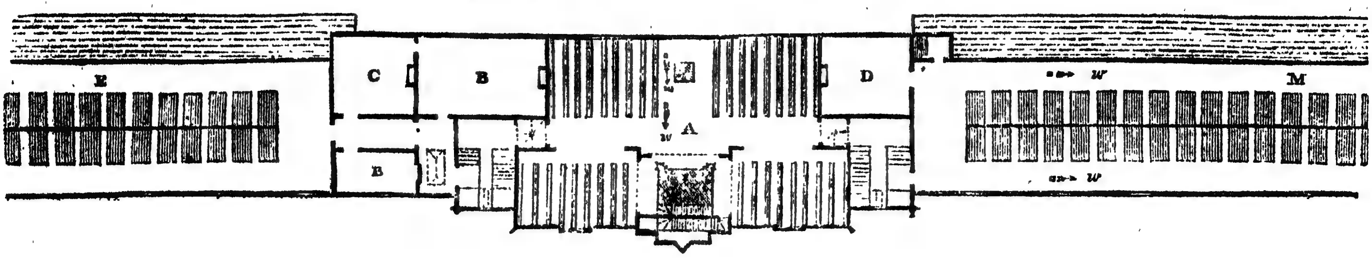


FIG. 7.—PLAN OF FIRST FLOOR, EASTERN WING (F, FIG. 2).

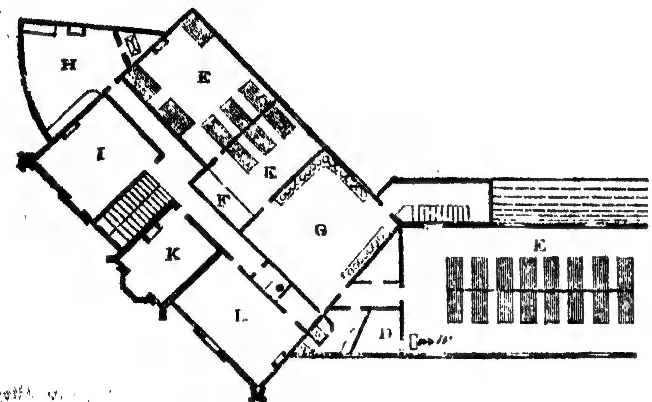
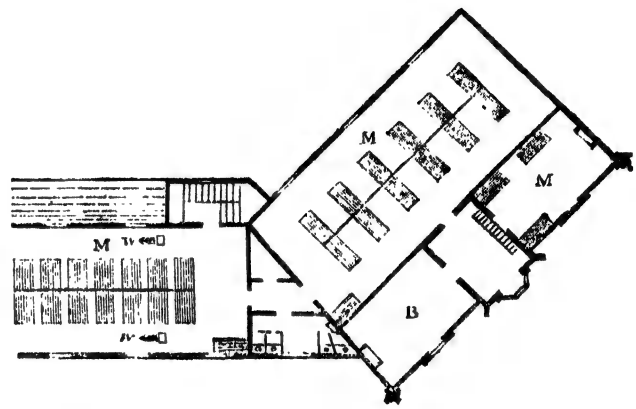


FIG. 8.—PLAN OF FIRST FLOOR, WESTERN WING (E, FIG. 2).



10 0 10 20 30 40 50 100

Scale of Feet to Figs. 3—8.

A, Chapel or Music room.—B, B, B, Linen rooms.—C, Bed room.—D, D, Assistants' Bed rooms.—E, E, E, Girls' dormitories.—F, Linen presses.—G, Girls' Washing room.—H, I, K, L, Superintendents' Apartments; consisting of, H, Kitchen; I, Bed room; K, Sitting room; L, Drawing room.—M, M, M, Boys' Dormitories.

FIG. 9.—SECTION OF GIRLS' WORK ROOM AND DORMITORY. (C, FIG. 2, and E, FIG. 6.)

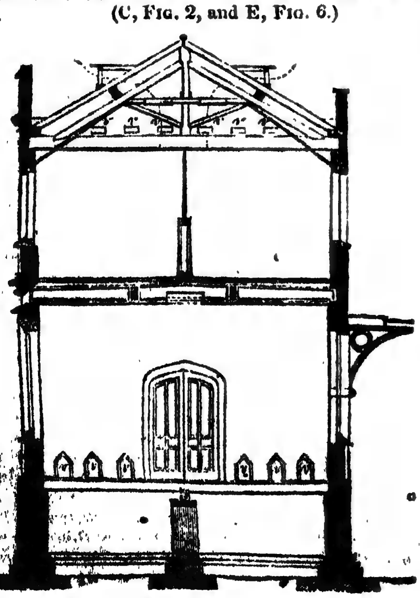


FIG. 10.—SECTION OF KITCHEN. (N, FIG. 3.)

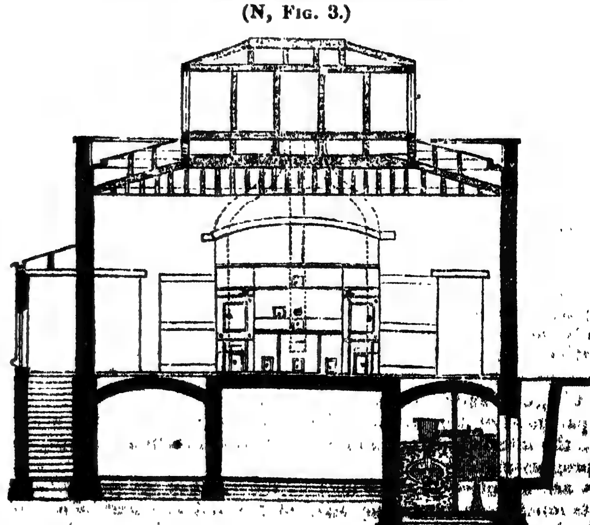
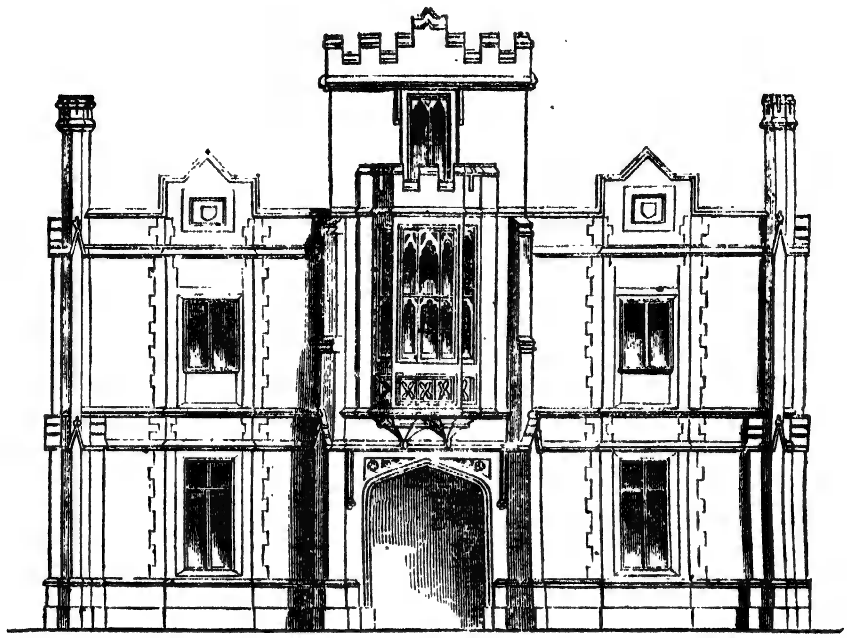


FIG. 11.—ELEVATION OF EASTERN AND WESTERN WINGS.

(F and E, Fig. 2).



The ventilation and warming of this building is very complete: the method adopted, is that of Messrs. Price and Manby. We shall give in our next number a drawing of the apparatus, and a description of the arrangement of the flues for the warming of the several rooms. The letters *w* and *v* which will be seen in various parts of the plans, indicate the apertures for the admission of warm air, and for ventilation: the course of the current of air from the stove, is indicated by the arrows.

In choosing this building as the subject of the present article, it was of course our main object to exhibit the architectural character of its elevation, and its various excellent and ingenious internal arrangements. Still, we cannot be content to be altogether silent respecting the nature and the objects of the Institution for which it has been erected. We confess that we see with peculiar satisfaction the forms of architectural beauty and the contrivances of mechanical skill, thus applied to a purpose which we believe to be truly noble and excellent. And we doubt not that our readers will agree with us, that our notice of the building would be incomplete without a short sketch of the nature and objects of the Institution. This we supply mainly from the last report, published in March.

The School for the Indigent Blind, was instituted by private benevolence in 1799. Beginning on a very small scale, it was in the course of a few years sufficiently encouraged, to enable its directors to purchase a part of the land which they at present hold, and to erect the buildings in which the school was till lately conducted;—in which indeed till the new building is completed, its operations are still partially carried on. In 1826, the directors and friends of the Institution were incorporated, under the title of "The President, Vice-President, Treasurer, and members, of the School for the Indigent Blind." The qualification of members is a donation of ten guineas, or an annual subscription of one guinea; a larger amount entitling to a proportionately larger number of votes for the admission of Candidates. The continually increasing support of the public towards this institution, enabled the Corporation in the spring of 1834 to commence the erection of the present building. The Western wing and the Centre were the parts first begun, and they have been for some time in use for the boys' department of the school. The Eastern wing is very nearly finished; the internal fittings and the few last external touches, are rapidly progressing.

Pupils are admitted to the school by the votes of the subscribers; applicants must be between the ages of ten and 25; and none are admitted who have a greater degree of sight than will enable them to distinguish light from darkness. They remain in the school till they have acquired a sufficient knowledge of their trade, which is generally acquired within four or five years, but which necessarily depends on the capacity of the pupil: they then leave the institution, with a portion of their earnings, and a set of tools for their respective trades. They are then able, according to their several abilities, to earn from six to 28 shillings a week. The girls are taught the spinning of fine and coarse thread, the manufacture of a peculiar kind of sash line which is much approved by builders, the netting of bags and reticules, and fine basket making: they are also employed in knitting and needle work. The boys are taught shoe-making, basket-making, and mat-making in various materials both fine and coarse. A large assortment of the articles manufactured at the school is always kept for sale; they will be found both useful and elegant. We may mention here, that the pupils regularly receive as pocket-money, a part of their earnings.

The religious and moral instruction of the pupils is, further, carefully attended to. Such instructions have usually been given orally, in the education of the blind; but we are happy to perceive that the system successfully adopted in America and elsewhere, of teaching them also to read by the touch from embossed books, has been introduced with some success here. We are also glad to find that the type employed is the usual Roman capital, not any arbitrary character. On this subject, and on the objections made to the new practice of of teaching the blind to read for themselves, we quote the following passage from a recent traveller in America.

"The common letters are used; and not any abbreviated language. I think this is wise; for thus the large class of persons who become blind after having been able to read, are suited at once; and it seems desirable to make as little difference as possible in the instrument of communication used by the blind and the seeing. It appears probable that, before any very long time, all valuable literature may be put into the hands of the blind; and the preparation will take place with much more ease if the common alphabet be used, than if works have to be translated into a set of arbitrary signs. It is easy for a blind person, previously able to read, to learn the use of the raised printing. Even adults, whose fingers' ends are none of the most promising, soon achieve the accomplishment. An experiment has been made, on a poor washerwoman, with the specimens I brought over. She had lost her sight eight years; but she now reads, and is daily looking for a new supply of literature from Boston, which a kind friend has ordered for her.

It will scarcely be believed that the objection to this exercise which is most strongly insisted on, is that it is far better for the blind to be read to, than that they should read to themselves. It seems to me that they might just as well

be said about persons who see; that it would save time for one member only of a family to read, while the others might thus be saved the trouble of learning their letters. Let the blind be read to as much as any benevolent person pleases; but why should they not also be allowed the privilege of private study? Private reading is of far more value and interest to them than to persons who have more diversified occupations in their power. None could start this objection who had seen, as I have, the blind at their private studies. Instead of poring over a book held in the hand, as others do, they lay their volume on the desk before them, lightly touch the lines with one finger of the right hand, followed by one finger of the left, and, with face upturned to the ceiling, show in their varying countenances the emotions stirred up by what they are reading. A frequent passing smile, an occasional laugh, or an animated expression of grave interest passes over the face, while the touch is exploring the meaning which it was till lately thought could enter only through the eye or the ear. They may be seen going back to the beginning of a passage which interests them, reading it three or four times over, dwelling upon it as we do upon the beauties of our favourite authors, and thus deriving a benefit which cannot be communicated by public reading.

One simple question seems to set this matter in its true light. If we were to become blind to-morrow, should we prefer depending on being read to, or having, in addition to this privilege, a library which we could read for ourselves?"*

It is with much satisfaction that we find the conductors of this institution expressing an intention to increase their stock of books for the blind (already containing the whole of the New Testament,) by the addition of further portions of Scripture, as well as other useful and instructive books. We wish they would add, entertaining also; for the blind have with the exception of sight, all the capacities of human nature; they have also, all its wants. We would give them all the means of mental and moral improvement which we possess by the use of books; nor would we deny them that innocent and delightful recreation which we derive from works of imagination;—perhaps even more necessary in their case than in ours.

Music, as a means of amusement and improvement, is not neglected. Pupils who show a natural inclination to it, are especially instructed in it, with a view to thus earning their livelihood. We were present at a music lesson given to one of the boys on the organ; and were much pleased with the manner in which he played the Hallelujah Chorus, exhibiting alike his own taste for his art, the excellence of the instrument, and the fitness of the room for musical purposes. We were pleased also with the playing of some of the girls, whom we found practising on the piano. And in the workshops too, a song was started now and then, in which any or all joined at their pleasure, giving a cheerful and happy appearance to their work, which we shall not soon forget.

The school contains at present 60 boys and 62 girls: five more of each sex will be admitted in July, at an election for which there are 49 candidates. The new buildings are calculated to accommodate 100 boys and 100 girls; and as we have seen, will speedily be entirely finished. We trust that public support will go on as heretofore tending more and more towards this excellent institution; and that its managers will soon be able to report their rooms full, and their list of candidates much reduced. We beg to suggest that in one respect this Charity is free from the objection to which some others are liable,—the tendency to produce more misery than they relieve, by offering temptations to imprudence. It most effectually removes the evils attendant on blindness;—but none would, either by design or through carelessness, become blind as a qualification for admission.

We add, in the Corporation's own words, their invitation to the public to come and see for themselves. We hope they will find our descriptions of the building tolerably complete and accurate: we are sure they will find our praises of the Institution itself fully justified by their own observation.

"Such is the nature of the School for the Indigent Blind; a charity which, in no slight degree, improves the condition and increases the comfort of those whose claims to compassion and assistance cannot be disputed. All persons desirous of observing the extent, to which the situation and faculties of the blind are capable of improvement, may satisfy themselves by visiting the School, which will be readily shown to them; they need not be apprehensive of seeing anything which can hurt their feelings;—they will not find the pupils (of a class hitherto considered as doomed to a life of sorrow and discontent) sitting in listless indolence, or brooding in silence over their own infirmities; but they will behold them animated in their amusements, during the hours of recreation, and cheerfully attentive to their work, during those of employment.

The pupils may be seen at work between the hours of ten and twelve in the forenoon, and two and five in the afternoon, on every day except Saturdays and Sundays."

* Retrospect of Western Travel, Vol. III., pp. [illegible]

PREVENTION OF THE DRY ROT.

Dry rot is a misnomer. This disease in timber ought to be designated a decomposition of wood by its own internal juices, which have become vitiated for want of a free circulation of air. If you rear a piece of timber newly cut down in an upright position in the open air it will last for ages. Put another piece of the same tree into a ship or into a house where there is no access to the fresh air, and ere long it will be decomposed. But should you have painted the piece of wood which you placed in an upright position, it will not last long; the paint having stopped up its pores, the intercepted juices have become vitiated, and have caused the wood to rot. Nine times in ten wood is painted too soon. The upright unpainted posts in the houses of our ancestors, though exposed to the heats of summer and the blasts of winter, have lasted for centuries; because the pores of the wood were not closed by any external application of tar or paint, and thus the juices had an opportunity of drying up gradually. If then you admit a free circulation of the air to the timber which is used in a house (no difficult matter) and abstain from painting that timber till it be perfectly seasoned, you will never suffer from what is called dry rot. And if the naval architect, by means of air holes in the gunwale of a vessel (which might be closed in bad weather), could admit a free circulation of air to the timbers; and if he could also abstain from painting or doing with turpentine, &c., the outer parts of the vessel till the wood had become sufficiently seasoned, he would not have to complain of dry rot. I am of opinion, that if a vessel were to make three or four voyages before it is painted or done with turpentine, &c., its outer wood would suffer much less from the influence of the weather than it usually suffers from its own internal juices, which cannot get vent on account of artificial applications to the pores. But still the timber would be subject to the depredation of the insect. To prevent this effectually, Mr. Kyan's process must absolutely be adopted to secure wood from what is called dry rot, in places where a free circulation of air cannot be introduced. I consider Mr. Kyan's process perfectly unexceptionable. The long arrows which the Indians use in Guiana are very subject to be eaten by the worm. In 1812 I applied the solution of corrosive sublimate to a large quantity of these arrows. At this hour they are perfectly sound, and show no appearance that the worm has ever tried to feed upon them.—*Waterton's Essays on Natural History.*

SMOKY CHIMNEYS.

It has often occurred to us that one very common cause of smoky chimneys, where no apparent reason can be discovered, arises from the practice of using boys to sweep them, and thus the sin against humanity is partly punished by a large amount of continuous annoyance. For a flue to draw well, it is essential that there should be only two openings into it—one at the bottom and the other at the top. Now chimney flues are divided from one another by single courses of bricks in width, or half bricks, as it is technically termed. Those flues are built with lime mortar, which is an absurdity in the outset, as the heat of the fire restores the mortar to the state of quick lime, which falls out in powder, and leaves gaping chinks for misdraught between the bricks, destroying the continuity of the flue. To provide in some measure against this evil, the practice is to coat the inside of the flue with a composition of lime-mortar with cow-dung, called "pargetting." This is, in fact, a luting to make the flue air-tight. The climbing boys, by frequent ascents, break the luting away, and the chimney, opening into chinks, produces an imperfect draught. This is an evil for which there is no remedy, except rebuilding the chimney. Were it the practice to use iron tubes built into the thickness of the walls, or better still—as more economical of heat—to introduce hollow iron columns upon the face of the wall, covering them in the apartments with perforated screen partitions, the great source of evil would cease, and the still greater evil—the crime—the degradation of humanity would cease also.—*Note to an able Critique upon Dr. Arnott's Stove, in the Lon. and West. Review, by "J."*

ANTI-OXYDATION OF METALS.

We have been favoured with an inspection of several specimens of copper and iron, prepared by Mr. Wall, with a view to the prevention of the oxydation of metals. We have also inspected a vessel (The "Mary") in Her Majesty's service, now lying in Woolwich Dock-yard, which has been sheathed with Mr. Wall's prepared copper. We have further seen a certificate signed by the Vice-Admiral and other Officers of Sheerness Dock-yard, stating "that the surface resists all action by acids, and that they are of opinion that it will resist any chemical action of the salt water. The test the preparation was subjected to was Nitrous Acid, which the surface resisted without any sensible change."

We have ourselves tested specimens of the prepared copper and iron with very strong Muriatic Acid and Nitrous Acid, neither of which produced any apparent change on either specimen. We consider the discovery of great national importance, as the process may be applied to the surface of all metals at a very trifling expense; we shall make farther inquiries and watch the progress of this invention, and lay before our readers in our next number such information as we may be able to collect respecting it.

REVIEWS.

The Steam Engine; its Invention, and an Investigation of its Principles, for Navigation, Manufactures, and Railways. By THOMAS TREDGOLD. Enlarged and edited by W. S. B. WOOLHOUSE, Esq., F.R.A.S. Part I., with 60 Plates. London: John Weale.

(*Second Notice.*)

IN the present edition, the original text of Tredgold has been reprinted, with corrections by the Editor, particularly in the mathematical formulæ. The additional matter, liberally provided with the view of bringing up the arrears of scientific knowledge on this subject to the present time, is given in the form of an appendix, as we stated in a former number. We proceed to notice in order, the various papers which it contains;—first observing however of the whole, that it embodies a vast quantity of information very valuable to the practical engineer: and that the reading of it has given us much pleasure and satisfaction.

No. 1, consists of observations ON MARINE BOILERS, by Mr. J. Dinnen, Assistant Engineer in her Majesty's Dockyard, Woolwich. From his situation, the author evidently enjoys great advantages for the prosecution of inquiries connected with his subject: and his manner of treating it, especially the amount of valuable experience which he brings to bear upon it, plainly shows that he has made good use of his opportunities of observation. Finding it totally impossible by mere extracts to give an adequate idea of the various matters contained in this paper, we subjoin an abstract of it, pretty fully comprising its subjects: and a few extracts have been introduced to show the author's own style of expressing his observations.

Mr. Dinnen begins with a refutation of the common opinion that the water of the Mediterranean is salter than that of other seas. From various experiments which are detailed, it appears that all sea water (except where exposed to peculiar influences, such as the influx of rivers, &c.) may, for practical purposes, be considered as containing an equal quantity of salt. From experiments made some years since by Messrs. Maudsley and Field, it is ascertained that sea water boiling under the usual low pressure of two pounds and a half on the square inch, will arrive at 226 degrees Fahrenheit in twenty-four hours, at 230 degrees in forty-eight hours, at 232 degrees in sixty hours, &c. At this period it contains $\frac{11}{33}$ of its bulk of salt, saturation takes place, and the deposit of salt on the surfaces of the boiler begins. Sufficient water was supplied during the experiment to supply the evaporation: in the instance alluded to, sixteen gallons per minute. Mr. Dinnen has frequently repeated the experiment and derived corresponding results. As the evaporation goes on, it is evident that the specific gravity of the water increases by the accumulation of the salt: and to raise an equal quantity of steam, continually increasing heat must be applied. Thus the thermometer becomes a practical register of the density of the water; and it may readily be adapted to the boiler for this purpose. The tendency of the continual evaporation being to leave in the boiler more and more salt, it becomes necessary to adopt some means of removing the accumulation; or rather, of removing the brine before it begins to deposit the salt. For this purpose Messrs. Maudsley and Field introduced a *brine pump* to remove from the lowest part of the boilers at each stroke, a certain proportion of the water supplied by the feed pump. In the experiment before alluded to, four-fifths of that water being required for the supply of steam, one-fifth was removed by the brine pump. By this means, the temperature (before shown to be an index of the specific gravity) was maintained regularly at about 226 degrees, six degrees below the point at which the deposit of salt begins. This brine pump Mr. Dinnen recommends for use in land engines, where fresh water is not to be had: at sea it has been superseded by the process of *blowing out.* Of the employment of this latter process, several instances are detailed: in one voyage to the Mediterranean and back, a portion of the water was blown out every two hours: the thermometer was maintained at 215 degrees, and no deposit formed. The same temperature was maintained uniformly in the voyage of the "Atalanta" and "Berenice," sent out by the East India Company, and the delay of blowing out completely every three or four days (the order for which is still in force in the navy) avoided: and this without any ill effect on the boilers.

Mr. Dinnen's experience goes decidedly against the introducing of iron into a copper boiler, as a specific against deposit or chemical action; the only effect appears to be the destruction of the iron, without any advantage. The action of the water alone, appears to have little or no influence on the copper; an incision made in a boiler with a chisel, remained unaltered at the end of three years. It is only when calcareous matter is allowed to accumulate, and adhere to the flues and fire places and even to fill up the water ways, requiring forcible mechanical means to remove it, that damage ensues. Accumulations of soot, salt &c. in the flues are to be guarded against as very destructive to the boiler. The salt comes from water which forces its way through the numerous insignificant apertures which it is impossible entirely to guard against by any care in the construction. The mixture of salt and soot corrodes the copper of the boiler very rapidly; as appears from the fact of copper being precipitated from it on the iron floor of the engine room, where in one instance it lay nearly two days. The defects alluded to, existing exclusively in the angle pieces and rivets of the bottom of the flues, have been completely removed by a fillet of Parker's or Roman cement, applied so as completely to enclose the angle pieces. This method may of course be applied also in iron boilers: but is recommended only in cases where mechanical skill has failed. Copper boilers appear more subject to decay from this cause than iron ones: bottom flue plates three-eighths of an inch thick have decayed in twelve months. The remedy is, to keep the flues well swept, and perfectly dry when not in use. The sulphate of lime begins to deposit sooner than the salt to crystallize: 220 degrees has been esteemed the limit (under the pressure of the atmosphere), but Mr. Dinnen (12) finds 215 degrees to be the maximum, and indeed subsequently (20) states that sulphate of lime *will* deposit and indurate at any temperature from 212 degrees upwards. The remedy here, as before in reference to the deposit of salt, is to blow out periodically and regularly. And we hope so simple and plain a remedy needs only to be forcibly stated to ensure its being attended to; it is, in fact, but one case out of the million where great damage and danger may be averted by timely precaution;—so true is the old adage, that "prevention is better than cure." To facilitate the process of blowing out, some useful hints are given respecting the construction and arrangement of the blow off cocks and pipes; and Kingston's safety-valve and pipe is strongly recommended as a means of guarding against danger from the large holes with which the bottoms of steamers are perforated. To the neglect of these precautions alone, Mr. Dinnen refers the serious damage often sustained by boilers even in a single voyage, and not to the intensity of the draught, which when well regulated, he views as a decided advantage. Iron boilers are more subject to blister and crack than copper, which is readily accounted for by the different modes of manufacture adopted for the two metals.

We have now followed Mr. Dinnen pretty closely through his first eight pages, and have we hope gleaned information interesting and useful to our readers. They will however have probably felt with us one defect which detracts in some degree from the great excellence of his paper;—the want of any very clear and well marked arrangement. Valuable pieces of experience, and useful remarks on the same or kindred subjects are separated by other observations, likewise useful, on other important subjects;—as indeed appears in our abstract. They are well worth attention as they stand: we merely suggest that they might be more readily referred to and more profitably read, if more systematically arranged. The latter part of the paper, entitled "Additional Observations and General Remarks," is more clearly arranged, being divided into certain general heads, and its minor divisions distinguished in the printing by the use of capitals and italics. Even here however, there occur occasionally remarks which might perhaps have been arranged better in other parts. We proceed to give some account of this latter portion of Mr. Dinnen's paper.

Where there are more boilers than one, much damage frequently arises from the side pipes communicating between their lower parts, becoming choked up. When this is the case, the blowing out cleanses only one of the boilers. Where each boiler is furnished with a cock for the purpose, it is not safe to blow out all at once; so that, severally they are not relieved often enough. Several examples are given, of the length of time which has elapsed between the necessary repairs of iron and copper boilers in constant use; they are all greatly in favour of the copper ones. And it is recommended that boilers in use beyond a limited period, regulated by the incrustations, should be scaled once a month while actively employed: this would not take more than two or three days, and would render violent measures unnecessary.

On the Construction of Copper Boilers.—Mr. Dinnen appears decidedly as the apologist of copper boilers; and he gives some hints on their construction which may help to bring them more into use again. The destruction of the bottom plates of the flues has been universally the cause of their abandonment, even when they were very sound in other parts. To remedy this defect the author recommends that care be taken to make the rivet holes in the lower angle irons coincide exactly with those in the plates, and the rivets properly fit the holes; and, in short, that the whole be done in an exact and workman-like style. This is absolutely necessary when working in copper; *seeps* which in iron would speedily be stopped by the na-

tural operation of rust, go on in copper indefinitely, working their way like worms in wood. So also, respecting the joints of the plates with the angle irons. For the protection of the lower part of the flues, exposed to the action of the salt which will come through notwithstanding all precautions, a coating of Roman cement is recommended, it having been found very useful even when the damage was partially done. The same care should be taken in the construction of the bottom and lower parts of the shell of the boiler as has been recommended in the case of the flues. The funnel should invariably be of iron, stepping on a cast iron ring fitted to the top of the boilers; for experience has proved that copper in this situation is rapidly corroded. The practice of throwing water into the ash-holes is condemned as tending to destroy the bottom plates, often while all the rest of the boiler is sound. To conclude, copper boilers are strongly recommended, notwithstanding their greater expense at first; if the necessary precautions be taken, they will require much less mending,—an important consideration in long voyages.

Circulating Pipes, Dampers, &c.—The side pipes between the boilers are often inaccessible, being concealed by the coal-boxes; so that they are liable to be left uncleaned and become choked up. They ought to be examined *at least* on the return from every voyage. Further means of circulation should also be provided; there ought to be free communication above the flues, and as near the surface of the flues as possible. The "Flamer" has lately been furnished with two tiers of connecting-pipes, the upper ones three inches below the level of the flues. Experience has proved, that it is unnecessary to cut the passages between the joining boilers sixteen or eighteen inches above the flues, as was once thought advisable. The best way of disposing the parts of a boiler is, in Mr. Dinnen's opinion, to have the two, three, or more parts running the whole length fore and aft;—each distinct. Each should have a damper of its own; as the damper fitted to the chimney will be sure to be carried away with the funnel, in case of its being by any accident swept overboard; and the ship thus exposed to the risk of fire. Each steam-pipe should have a communication-valve; or a valve should be fitted on top of the steam-chest of each boiler, where they join the common steam-pipe; so that any of the boilers may be used independently of the rest. Several important advantages are pointed out as likely to flow from this arrangement. Fuel might be much economized by coating the boilers, steam-pipes, and cylinders with non-conductors; which has been done to some extent in the navy. The following hints also respecting the firing are useful:—

> *Economy of fuel* on long voyages has not, I am prepared to say, met with the attention it deserves: stokers consult their own convenience; and as long as they keep *plenty* of steam flying off to waste, they are seldom called to account [illegible] myself, I have found the greatest difficulty in obliging them to [illegible] the fires uniformly. In a gale of wind, and then only, when the labour was little on the fires, and when it became a consideration with every one, both on deck and below, to eke out the means of arriving at the destined port in safety, the fires were minutely attended to, and the fullest effect obtained at the least possible expense: a few *clinkers* only, and *no ashes*,—which should never, in iron boilers, be allowed to remain longer than two hours in the ash-pits, or in contact with the boilers on the stoke-hole plates,—were thrown overboard twice in twenty-four hours, when such discipline was observed, and this with the Welch coal. How much greater would the gain be *at all times*, if the oppressive heat, which drives the fireman from his quarters now, were removed, so as to permit him to dispose a *less* portion of fuel to a wonderfully increased advantage? These considerations are by no means visionary; the people in Cornwall understand them well, and profit thereby to a considerable amount. I have, on a summer's day, found it sensibly cooler in an engine-house closed, containing a cylinder eighty inches in diameter, and ten feet stroke, while the steam-gauge indicated thirty-four lbs. per square inch on the safety-valve, than I experienced without: the boiler-house nearly the same. Is not economy in fuel as loudly called for in marine engines, without reference to stowage, health, and the labour and dirt of shipment?

The best number and arrangement of furnaces is considered, and their size discussed: it is recommended to make them not less than three feet wide, as the fires act destructively on the sides of narrower ones; nor more than six feet long, as that is about the greatest manageable length for the stoker. In the arrangement of plates in the furnace, perpendicular seams should be avoided, as liable to injury. It is very usual to employ iron plate of too great thickness for the furnace: in the largest boilers, three-eighths is quite thick enough for the plates above the bars. But the lower parts of the sides, and the bottom of the fire-place, should be thicker. The up-take should also be thicker, and frequently cleaned, and coated with some anti-corrosive. Various hints are given for securing the top and sides of the boiler from dirt and corroding influences; and warnings thrown out, against the use of wood too near the heated surfaces. The error of making the water-ways too small, is pointed out; Mr. Dinnen recommends never to make them less than four or five inches, and even more when they come between the fire-places. Some useful hints are given respecting scaling, and the necessity of having due time allowed, insisted upon. The flues need never be larger than to allow convenience for repair and sweeping. In blowing off, there is a danger of leaving the boiler deficient in water, which must be carefully guarded against. A "detector-pipe" is now used in some vessels, to give notice of this danger; a description of which is given, as also of a contrivance by Mr. Kingston to prevent the accidental leaving of the cock open. Copper-floats, with an index in front of the boiler, are recommended in preference to the glass water-gauge, for showing and regulating the height of water within. It is recommended to make the reverse valves full four inches in diameter, and to keep them always clean and ready to act;—points too seldom attended to. Some useful hints are given respecting the fixing of boilers, tending to their preservation. A suggestion is also thrown out, that in war it will be found useful to have the boilers distinct, in case of one being disabled by a shot.

Remarks on Atlantic Steam Navigation.—Under this head we find principally observations on economy of heat, and saving of fuel. Waste from cylinders and boilers for want of coating, is here illustrated by detailed accounts of experiments, and calculations founded upon them. And extracts are given from the author's journal of a Mediterranean voyage, to enforce his rules for the economizing of fuel. Some useful hints are suggested respecting the sweeping of flues, which appears to be less frequently necessary on long voyages than might be supposed; here too, we have facts obtained by observation brought forward in proof of the author's views. The remarks under this head are very valuable, especially from the facts which they record; we only regret that they were not brought forward in proof of what the author advanced in the earlier part of his paper, on the several subjects of waste by radiation, economy of fuel, &c. This section ends with a hint to charge the boilers with fresh water as often as possible; and with the following short summing up of Mr. Dinnen's views of the prospects of steam navigation for long voyages:—

> The only question of a vessel's continuance at sea, for any consistent period of time, is—the fitness of the engines,—the conduct of the boilers,—and the quantity of fuel which she can stow, compared with her consumption. Consequently the probable capacity of a steam-vessel for the Atlantic or any other voyage, so far as her machinery is concerned, may be fairly estimated before she finally sets out for her destination; the contingencies of weather on the particular service being duly considered.

Paddle Wheels.—Mr. Dinnen has remarked, that the parts of the wheels below and near the water line are subject to much more rapid decay in the Mediterranean, and between the Tropics, than elsewhere. This he attributes mainly to the great heat speedily evaporating the water left by the spray, and thus depositing brine and salt, which speedily corrode the machinery. He considers however, that another powerful agent is at work in this destruction: having observed that marine vegetation, barnacles, and lime are very abundant in the neighbourhood of the paddles, while the rest of the bottom is clean, he concludes that this effect is owing to the galvanic influence of the copper sheathing, which is thus protected at the expense of the paddle-wheels. And this conclusion he has found confirmed by the examination of all her Majesty's steam-vessels returning from the Mediterranean and West Indian stations, which constantly exhibit the same appearances. To remedy this defect, Mr. Dinnen proposes to apply to these particular parts, protectors on Sir Humphrey Davy's principle. And having thus only to contend further against the influence of the sea-water before alluded to, he gives some good hints on the construction of the paddles, and the following simple receipt for a protecting varnish:—

> I have found coal tar, heated by a shot plunged in to drive off the naphtha, when applied to such parts as were chafed, or otherwise left unprotected, to be a very good varnish for paddle wheels; the wheels being examined, and covered in such places on the arrival from *every* voyage: by this treatment, a paddle wheel may resist the action of the sea water for several years.

The next paper, No. II. entitled A Form of Steam Journal, is by Thos. Baldock, Lieut. R.N., K.T.S. It contains some useful remarks on the necessity of keeping a proper record of the operation of the engines in all steam vessels; and furnishes a form for the journal, with directions for the regular insertion of all matters which it is desirable to register in its columns.

No. III. is on the Motion of Steam Vessels; its author is P. W. Barlow, Esq., C.E. After remaking that different circumstances require different constructions of the machinery, river navigation, and long and short sea voyages demanding each their peculiar adaptations; Mr. Barlow enters on a comparison of the different kinds of *Paddle Wheels* at present in use.

> The power of the steam engine, when employed in propelling vessels, being applied through the medium of a fluid by the reaction of the paddle wheel,

there results an unavoidable loss of a large portion of the power of the engine. To construct a wheel by which this loss will be reduced as much as possible, is an important point to be aimed at, and many inventions have appeared with the view of effecting this object. We therefore propose, in the first place, to enter into a comparison of such of these wheels as have come into general use, and to endeavour to illustrate the nature of their action.

The construction of the ordinary paddle wheel is so simple as scarcely to need description: it consists of a circular framework of iron, supporting paddles at equal distances round the rim, and radiating from the centre: these wheels are attached to a strong shaft passing through the vessel, to which the motion of the engine is conveyed by cranks placed at right angles to each other: the revolution of the floats or paddles in the water creates a resistance upon them, and the corresponding reaction on the main shafts produces the force by which the vessel is propelled.

It is evident, that in this construction of wheel two kinds of lost power must exist: first, by the action of the paddle being oblique, or at an angle with the horizontal direction of the vessel in every position except the vertical one, by which of course only a portion of the power exerted on the paddle becomes effective; and secondly, by the receding of the wheel in the water necessary to create a resistance equal to the force applied by the engine. This may perhaps be best illustrated by the case of a locomotive engine: if the friction between the wheel and the rail be such that the former does not slip, the motion of the carriage will be the same as that of the circumference of the wheel; the whole power of the engine is employed in propelling the carriage, and consequently there is no lost power: but if the friction be not sufficient, the wheel will slip back some quantity; the same steam will be consumed in the revolution of the wheel, but the carriage will not be advanced as before, and there will be a loss of power proportional to the skidding or receding of the wheel: so also in a steam vessel all that the centre of pressure actually goes back in the water, or all that its circumferential velocity exceeds that of the vessel, is comparatively lost power; the expense of the steam being proportional to the former, and the effect to the latter.

This source of lost power must of course exist in all paddle wheels, whatsoever their construction, from the resistance being created in a fluid; but that kind first described being owing entirely to the radiation of the paddles, a great number of inventions have been proposed to remedy the evil, by causing them to keep a vertical position by the aid of machinery during their progress through the water. These wheels, although they possess much superiority over the ordinary construction in a sea, or where the wheel is deeply immersed, by obviating the loss of power from the obliquity of action and back water, are subject to evils of another description; and it is a question of doubt, whether the common radiating wheel does not admit of a construction, which, in average of weather and circumstances attending a sea voyage, might lead to as little loss of power as the vertical wheel, and at the same time possess the advantage of less liability to derangement.

The first vertically acting wheel which has been employed to any extent in this country is that commonly known as Morgan's wheel. The original patent for this construction was granted to Elijah Galloway, and sold by him to Mr. William Morgan; but it has since that time undergone considerable improvements in its structure and arrangement, and is now extensively adopted by Government in the Admiralty steamers. * * * *

In the year 1837, Messrs. Seawards fitted a vertically acting wheel to the "Levant" steam boat, in which the positions of the paddles are similar to the above, but are brought about by a different arrangement of machinery. This wheel formed the subject of a charge of piracy, on the grounds of being a colourable evasion of the patent of Elijah Galloway. The Vice-Chancellor having given judgment against granting an injunction, the parties tried an action at law, in which they were also unsuccessful; and Messrs. Seawards have now the privilege of making these wheels. * * *

The main difference in the construction of the two is the excentric, which by being fixed at the side of the vessel, instead of in the centre of the wheel, is less adapted to giving motion to the paddles, from acting at one end of them, but has the advantage of allowing the shafts to be continued through the wheel, which certainly adds to its strength.

The author then proceeds to describe a great variety of experiments on Admiralty steamers with various kinds of paddle wheels; the results of which are concisely given in a tabular form. From these he deduces the following useful practical rule to ascertain the power of the wheels.

The diameter to the centre of pressure, or effective diameter of the wheel, being known, we at once deduce the excess of the velocity of the wheel over that of the vessel, or that at whichit recedes in the water to produce the resistance necessary for propelling the vessel. The rule for ascertaining the amount of this resistance or pressure on the vertical paddle, is to multiply the square of this velocity by the area of the paddle board and by $62\frac{1}{2}$ (the weight of a cubic foot of water in lbs.), and divide by $64\frac{1}{3}$; the pressure upon a surface moving in a fluid, being equal to the weight of a column of water whose base is the area of the surface, and altitude that through which a body must fall to acquire the velocity. This number, multiplied by the velocity of the wheel, will express the power expended on the vertical paddles; and this divided by the whole power of the engine, will give the proportion consumed on the vertical paddle, given in column 18.

Next follows a Table, exhibiting the ratio of the velocity of the wheel and vessel, the pressure upon the vertical paddle, and other results calculated from the preceding experiments. It is to the last column of this table, that reference is made both in the preceding, and in the following, extract.

In examining column 18, a striking difference is seen in the proportion of the power of the engine expended on the vertical paddle, in Morgan's wheel and in the common wheels; the mean of the former being ·546, and of the latter ·151 and ·197. The difference arises from the nature of the action: *in the new wheel the vertical position is the most effective in propelling the vessel, and in the common wheels the least so*;—a fact which, although little known among the projectors of paddle wheels, and even among engineers, who are constantly witnessing their daily performance, it is very essential should be understood before any calculation or judgment can be formed of the construction and proportion of wheels best adapted to steam vessels, under the different circumstances and various kinds of duties in which they are employed: we beg therefore to call the attention of the reader particularly to this point.

The author explains the manner in which the power of the engine is expended, both in the common paddle wheel, and in the *new one* (Morgan's) with *vertical paddles*; and draws a comparison between the lost power in the two.

In the action of the common wheel there arise, as we have before described, two kinds of lost power,—one from the retrograding of the wheel, and the other from the oblique action of the paddles; and we are now enabled to estimate the amount of each of them with considerable accuracy, and thus to draw a comparison of the efficiency of the two constructions of wheel in different states of immersion. * * * * * *

When the wheel is slightly immersed, little or no advantage is gained from the vertically acting paddle, the loss from the additional velocity required to obtain the necessary resistance or receding of the wheel, being fully equal to that of oblique action in the common wheel. The only remedy for such an evil is the increase of the number and dimensions of the paddles, both of which are difficult to accomplish in Morgan's wheel: we may therefore very fairly conclude, that in the navigation of rivers or smooth water, where generally little variation is required in the degree of immersion of the vessel, the common wheel, if properly proportioned, is preferable to the vertically acting wheel, in consequence of its admitting of a larger surface of paddle board.

In the case of deep immersion the effect is very different: here the loss from oblique action in the common wheel becomes very serious, so that the total loss of the engine amounts to ·447 of that expended, while the loss from Morgan's wheel remains nearly the same. It therefore appears that the latter has great advantages over the common wheel for sea purposes or long voyages, where the immersion of the vessel is constantly diminishing by the exhaustion of the coals and other stores required at the commencement of the voyage. The loss from the oblique action of the paddles must also be very great in rough weather, from the degree of immersion to which the wheel is subject; in addition to which, the paddles entering the water with so great a velocity, receive a reaction or blow which has the effect of nearly bringing up the engine, and there in consequence results a loss, in addition to that of oblique action, from the power required to put the mass of machinery again in motion. The advantage which the common [illegible] possesses in still water, of presenting a larger surface of paddle board, [illegible] now exist, as a large surface has a tendency to bring up the engine, and throw all the work on the oblique paddle, which is in every case disadvantageous. In fact, the desideratum that has to be aimed at in every wheel, is to throw as much work as possible on the vertical paddles, where there is no loss from oblique action; which can be accomplished in the ordinary construction when the immersion does not exceed one-fourth of the radius, and a large surface of paddle board taken advantage of; but at sea it can only be effected by reducing the number and surface of board, which is at a great sacrifice of speed when the vessel is in still water,—a condition to which the same vessel is of course liable; and hence arise the disadvantages and loss of power of the ordinary wheel for sea purposes.

The next paddle wheel for consideration is the *cycloidal*; to the description of which the author applies himself, after premising the following observation.

The vertical wheel, although possessing in its action the advantages we have pointed out, is however attended with several serious practical objections. To effect the vertical position of the paddles, considerable complication is necessary in the construction, and a great number of moving parts are required, which are not only attended in the commencement with a great outlay, but require continual repairs, and are liable to derangement. * * * * * * *

The principle of this contrivance consists in dividing the paddle into a number of parts, which are placed upon the wheel in the curve of a cycloid, so that they enter the water at the same spot, and follow one another so rapidly as to cause little resistance to the engine on entering the water; and afterwards separate, so as to afford full scope for their action in passing the centre, and in coming out allow the water to escape readily from them. * * * * * * *

In river navigation, where there does not exist the necessity of deeply immersing the wheels, and the common paddles can be made much broader without inconvenience, the advantages of this construction will not be so much felt: at the same time, it may always be employed beneficially, and will occasion less lost power than the common wheel.

The formulæ for ascertaining the relation between the diameter of the wheel, the area of the paddle, and the velocity of the vessel, will be of great service to the steam-ship builder. The advantage to

be obtained from *reefing the paddles*, is pointed out; and the devising of an easy and expeditious mode of effecting this object, is mentioned as a subject deserving attentive consideration.

A ready method of reefing appears at present to be attended with some practical difficulties, from the alterations that are made being required while the vessel is at sea. The advantages which would be derived from it, particularly where speed is of importance, are evidently so great, that I hope still to see it accomplished; but should it ultimately be found impracticable, the best remedy is the use of the vertically acting or cycloidal wheel, and keeping the diameter as large as possible, by increasing the length of the stroke of the engine, so that more or less immersion will make comparatively less difference in the action of the wheel; the larger the vessel the less will be the loss, because the diameter of the wheel increases in a greater ratio than the degree of immersion. In the Victoria, which is fitted with the cycloidal wheels, it is proposed to remove the outer paddles before starting, and to replace them during the voyage when the vessel is sufficiently light, which, if it can be effected, will be attended with considerable advantage; but much less than if a ready method of reefing could be devised, so that the surface of the paddle-board should be at the constant command of the engineer.

Mr. Barlow enters very fully into the consideration of the means of adapting steam vessels to long voyages,—a subject exciting vast attention at the present day; this portion of the paper will consequently be read with much interest. After enumerating different performances of various government steam vessels, the author sums up with the following cheering view of the prospects of Atlantic steam navigation.

The results of these voyages are indeed so favourable, as to set the question at rest as to the practicability of the American voyage; the consumption of fuel has been so reduced by the superior construction and manner of working the engines, that these vessels, although comparatively small, are enabled to perform a voyage much exceeding that to New York; and consequently the American Steam Company's vessels, whose capabilities for distance are greater in the ratio of 7 to 9, from the superior tonnage and power, must perform the voyage, under any circumstances, with the greatest facility.

The following observations are given under the head of *Iron steam boats*, the general adoption of which Mr. Barlow looks to as probable.

It is necessary to mention, among the improvements which are likely to add to the capabilities of steam vessels for making long voyages, the introduction of iron as the material of construction, the use of which has been attended with complete success in every instance in which it has been tried. The advantages of iron vessels are stated to be, that they do not weigh one-half that of a timber sea-going vessel, and they therefore draw considerably less water, and give a greater speed with equal power; greater safety, in consequence of being divided into water tight compartments by iron bulkheads; and greater economy, as they do not require so many repairs. The capacity is also increased for passengers and goods: a wooden vessel of 30 feet beam is only 27 feet 6 inches inside, while an iron vessel would be 29 feet 6 inches; consequently a saving of two feet is produced throughout the whole length of the vessels.

To the advantages enumerated, we would add what we consider a very important one arising from the use of iron as the material of construction,—that it will obviate the dreadful and hazardous effects of fire, to which steam vessels as at present constructed are fearfully liable.

No. IV. is a Time and Traverse Table, by Captain Robert Oliver, R.N.; calculated to show the advantage of rigging steam vessels for long voyages on the principle of spreading the greatest quantity of canvass, with the least possible resistance from masts and yards when steaming.

No. V. (and as far as the work proceeds in the present part, the last,) consists of a Memoir of her Majesty's Steam Ship the Medea, during a service of nearly four years, by Thomas Baldock, Lieut. R.N., K.T.S. It contains a great deal of valuable information on the subject of the adaptation of steam vessels to long sea voyages, and their applicability to purposes of war,—information the more important from the circumstance of the "Medea" having undergone a fair trial in her four years hard and constant service in the Mediterranean.

This ship was launched at Woolwich in September, 1833, and immediately fitted with two engines of 110 horse power each, by Messrs. Maudslay and Field, who had supplied those to the other four war steamers, and who had succeeded by their adaption of boilers, &c. in producing the best possible effects with the least proportion of fuel then known; the wheels being according to the plan of Mr. Morgan, with the revolving vertically acting paddle, of which a full description is given in another part of this work.

The masts, sails, and rigging, as well as the internal fittings, were principally proportioned by the constructor, assisted by such modifications as the skill and experience of Captain Austen, and Mr. Peacock, the able master of the vessel, suggested. It will not be uninteresting to our nautical readers to state, that the Medea has three masts,—the foremast being rigged nearly as that of a brigantine; the mainmast and mizenmast having each a lower gaff-sail and gaff-topsail; the arrangement of the standing and running rigging being so adapted, that the upper masts, yards, &c., may be lowered to the deck with the greatest facility, and again reinstated with little labour,—thus affording the least possible resistance when steaming head to wind, and yet spreading a large quantity of canvass, when under sail, and all the gear in its place.

The armament consists of two guns of great calibre, capable of carrying heavy shot further than the range of the largest guns in use in sailing ships of war, and also calculated to throw shells: besides these heavy pieces of ordnance, which are mounted on pivots, one before the foremast, and the other abaft the mizenmast, she has less guns of considerable weight, intended to be "transported" about the deck as occasion may require, with a full proportion of small arms for a crew of 120 men, for the purpose of repelling boarders, should unforeseen and improbable circumstances place her in close contact with a heavy vessel of war,—the obvious tactics of a war steamer being to keep out of range of an enemy's guns, which she may always do by maintaining a position in the wind's eye of an opponent, and assailing her adversary with very little chance of receiving any damage in return,—a good steamer having no difficulty in keeping to windward of the best sailing ships, even in strong winds: and it is quite evident that in a calm the steam vessel may take any position she pleases.

During the period of her accompanying the fleet under Sir Josias Rowley, which she joined at Vourla Bay in the autumn of 1834, the "Medea" exhibited her powers of sailing independent of steam;—proving indisputably, that steam ships can be so built as to sail equally well with any other vessels. In his Memoir, the author has given several particulars of her sailing, which go to prove this point; we select the following instance.

The first trial of sailing after the Medea joined the squadron was on the 3rd of November, in company with Her Majesty's ships Scout, Childers, and Columbine. These vessels being ordered on some detached service, it was considered a good opportunity, as the wind blew directly into the Bay of Smyrna, for the steamer to test her qualities of "beating" to windward with such fast sailing ships; and we accordingly find that, although labouring under all the disadvantages of a first experiment, which the seaman will not fully appreciate, she was, with wheels revolving loosely in the water, nearly equal to both the first-named vessels, and only beaten in any very decided degree by the Columbine, built by Sir William Symonds, the present Surveyor of the Navy. Having gained the outside of the bay, the ships proceeded towards their destination, and the Medea remained for some hours exercising the crew, in performing the evolution of "tacking," and in developing such modifications as might be applicable in the performance of her duties as a sailing ship of war, of which she had hitherto had no practice. It was ascertained that, with the moderate breeze then blowing, she made nearly a straight course at five points from the wind, and meeting with two Greek polaccas, well known to be fast vessels, she joined company, beat them both "on a wind," and returned to the anchorage at Vourla.

The Lieutenant further points out important advantages as likely to result from the co-operation of steam vessels with ships of war: but as we have already exceeded our limits in extracting from the various papers contained in the work before us, we are precluded from giving several very interesting passages to be found in the memoir of the "Medea;" and must content ourselves with confidently recommending it to the attentive perusal of our readers.

We feel it also incumbent upon us to state, that the numerous engravings accompanying both this memoir and the other papers in the Appendix, will be found deserving of the attentive consideration of the professional reader. We look forward anxiously to the appearance of the second part of the work, and shall recur to the subject when we have the whole before us. If the second part prove equal to the first, the present Edition will be a work of national importance, and of standard value for reference by the profession.

A Treatise on Engineering Field-work: containing practical Land-surveying for Railways, &c., with the theory, principles, and practice of Levelling, and their application to the purposes of Civil Engineering. By Peter Bruff, Surveyor, &c. London: Simpkin and Marshall, 1838.

Mr. Bruff's work begins with directions to be observed on commencing a survey,—method of taking offsets,—of surveying single enclosures,—of taking inaccessible distances with the chain, as the width of a river, &c. Most of these observations are to be found in all similar works; but of course, in an elementary book intended for students, they are necessary for obtaining a correct knowledge of land-surveying.

There follows an *Example in Railway Surveying*, illustrated by a plan showing the method of surveying and laying down the base line, and surveying the property on each side. This will be found useful by the student.

The following article, on *Parish Surveying*, is too brief; consider-

ing the vast importance of this description of surveying at the present time. The principal part of the matter, has been selected from Captain Dawson's directions for the Tithe Commutation Survey. The following passage which we select, contains some useful hints:—

The extracts we have made from Captain Dawson's Report are so much to the point, as necessarily greatly to abridge our remarks, which will be confined simply to the guiding and directing persons in the measurement of such lines as are therein recommended. In the first place, then, we will endeavour to point out the best and most correct method, of measuring the principal base through the entire length of the parish. Previously to commencing or arranging the work, the surveyor should, if possible, procure an old map of the parish, which, however incorrect it may be, will still serve generally to point out the best parts of the parish through which to pass his lines; but whether this is obtained or not, let him be in no hurry to lay out the work, but look carefully to the consequences resulting from transverse lines running through various parts of the parish—whether their extremities can be easily connected, and if they intersect any particular or important points within, or are on, with any without the parish. This is particularly to be attended to, as it would greatly facilitate the tracing of the boundary at any future time.

We will suppose, then, the surveyor to have decided on the point of commencement and direction of the base, which, if possible, should be on, with some conspicuous permanent mark, without the bounds of the parish, as a church, windmill, house, or such like. At this point set up your theodolite, and ascertain very exactly the angle formed by this line with the magnetic meridian; then take angles to several conspicuous objects around, which would serve hereafter very accurately to determine the point. At this spot erect a pole, very perpendicular, and commence the measurement of the line; but before proceeding further, it cannot be too strongly enforced on the surveyor's mind the absolute necessity of extreme exactness in this part of the operation; for which purpose a much longer chain is recommended than that usually adopted.

At about every five or ten chains, it would be advisable to drive a stake firmly into the ground, with the chainage inscribed thereon in Roman characters: thus, if at every ten chains, call the first ten 1, at twenty it would be 2; or if left at every five chains, at five it would be 1, at ten it would be 2, and so on. The reason of this will be presently apparent.

The roads, rivers, brooks, fences, &c., as they are crossed, should be very carefully noted; but in this stage of the proceedings it would be quite useless putting down false stations at nearly all the fences, as in common surveying. Offsets, if within distance, should be taken to all conspicuous objects. At certain prominent points, as you pass along, set up poles; these will serve to keep you in a direct line, even if you entirely lose your forward object. Your forward chainman must at each chain's length plumb back to those poles you have erected, and by keeping them exactly in a line, you need not fear of departing from your true course.

If you come upon a house, or gentleman's pleasure ground, through which it is impossible to measure a line (but this always should be avoided, if possible:) the means of overcoming the difficulty will be found by referring to a chapter on the subject, in the section devoted to levelling; but the most ready and correct method would be, very carefully to measure an angle with the theodolite, either to the right or left of your line, of exactly 60 degrees, and measure out any length until clear of the obstruction; then take another angle of exactly 60 degrees, and measure the same distance as the last line. This will bring you to the exact spot you would have arrived at, could you have continued your line on without interruption. You will thus have measured two sides and angles of an equilateral triangle. The remaining angle and side will be the same; that is, the angle will be 60 degrees, and the distance, if it could be measured through the obstruction, would be exactly the same as that of either of the measured sides; or a line forming any angle with the base (but which must be determined) being measured clear of the obstruction, and an angle taken at the extremity so as to cut the base beyond the obstruction, the length of this side and of that passing through the obstruction may be easily calculated by plane trigonometry. This difficulty overcome, and the continuous distance entered into your book, we will proceed onward; but the poles you have set up behind are not visible, neither probably is your forward mark. To extricate yourself from this dilemma, measure the supplementary angle of 120 degrees from the last measured side of the equilateral triangle; this will direct you in the precise line; but to verify it, ascertain its bearing, which would be the same as at first: and in this manner you will be able to overcome all similar obstructions.

We will now suppose the surveyor arrived at the extremity of his base, where he must set up his theodolite, and take the angle of one of the side lines, which should not be very oblique, but as near 45 degrees as circumstances will admit, and, as directed for the base, should, if possible, be in a line with some natural mark. To measure this angle which is most important, with the requisite degree of accuracy, it should be repeated several times, and a mean taken as the correct angle. Set up a pole at the extremity of the base, and measure this line in a similar manner as directed for the base, putting down stakes at intervals. When arrived at the boundary of the parish, or so far as may be desirable, set up the theodolite and measure an angle from the last line to some object on the opposite side of the parish, transversely, to your base, and another angle to the first station at the commencement of the base line: set up a pole at the exact spot from whence the angles were taken, and measure the transverse line, which can be measured in a perfectly straight line, by adopting the same means as already directed. When this line is measured up to the crossing of the principal base, stop, and from one of the stakes previously left, measure up to the exact spot at which you cross, and enter the two distances in the field-book. Continue the measurement of the transverse base (driving in stakes at regular intervals as before), to the extremity of the parish, or so far beyond it, as by tye-lines, measured to the extremities of the principal base, the entire parish can be circumscribed; or leaving out such small portions only, as may be determined by small triangles from these principal lines.

In throwing out triangles to enclose any part of the parish that may be without these side lines, if an instrument be used, there will be no occasion to extend them back to the base, without the figure should be very large, or the internal lines can be used for other purposes, than merely to verify the position of the figure; but where a chain only is used, it is indispensable to the correct fixing of the figure that those lines should be so extended to one of the bases. From the extremity of the transverse base, very accurately observe the angles of the tye-lines to the extremities of the principal base, and measure these tye-lines in the same accurate manner as the bases, leaving stakes at intervals, and taking offsets to the parish boundary and conspicuous objects wherever within distance. When these angles and tye-lines are measured and protracted, there will be four principal stations in the parish very accurately determined; and by these stations being correctly fixed, each stake on the lines connecting the stations, may be considered as a correctly determined station, and used as such.

It would be advisable, before filling in any portion of the work, to get the boundary of the parish, and all the work laying outside the lines; but if not all the boundary, at least the part on that side from whence it is intended to commence filling in. Internal lines may now be used wherever it is thought necessary, the surveyor confining himself to one portion of the survey only, and entirely filling it up before any other part is commenced; his work will then never get confused. With regard to the direction of such lines as it may be necessary to measure within the principal ones, circumstances must alone direct; but lines may be measured in any direction within this boundary, without regard to poles or false stations that may have been erected during the measurement of the base or tye-lines; for, having stakes at regular intervals of five or ten chains, the distance from any one of them to the point at which an internal line crosses can be measured, and the point determined as correctly as if that spot had been fixed on for a station, when measuring these principal lines; and thus can lines be measured in any direction, always observing that from one point to another must be perfectly straight. The angles of the first few internal lines should be very carefully taken, which will fix their position without regard to their measurements; and on the scale being applied thereto, the distance at which any one of them bisects either of the principal lines will be the same as measured in the field, and the point bisected will be at the same chainage as determined by reference to one of the stakes. If on protraction of the angle it should not pass exactly through the point as determined by measurement, it should be made to do so; more dependence having to be placed on the distances than the angle in this case; but by taking the angle, any error committed in putting down or measuring from any one of the stakes will be immediately detected: points thus determined must be correct.

If the surveyor is expert in the use of the sextant, it would be very desirable to have the angles taken of all the lines, except where well tied; but where only determined by their extremities, the angle should in every case be taken. Particular care is necessary in reducing lines measured over steep ground, to the horizontal plane; for the method of doing which, see description and use of theodolite, also the method of correction with the chain only. The surveyor is advised to lay down his work as he proceeds, if done every day it would be best; he will then, in the event of committing an error be able immediately to rectify it. The sextant may be used with advantage in filling in, but on no account should any other instrument than the sextant and theodolite be employed.

With regard to computing the aggregate quantity of land in the parish, the principal measured lines, as suggested by Captain Dawson, may be used for that purpose, equalizing and arranging into triangles what may be without; and for the separate enclosures within, they may be equalized and arranged in a similar manner. But it would appear to us the most correct method to form parallelograms, or squares, as usually done in large surveys, of about two chains, by which the quantities in each enclosure would be very correctly ascertained; and for the aggregate, every fifth or tenth parallelogram might be distinguished by a thicker line; the aggregate could then be easily calculated, there being so many parallelograms of ten or twenty chains square, or as much larger as pleased; the broken parts of the parallelograms would be calculated as directed in another part of this volume. By this method the contents of all the enclosures added together, and the computed whole would be found (if carefully done) to be so nearly the same, that the difference would be beneath notice. The contents of the whole, computed by the measured lines, might be used as a check on the proceding method. The lines forming the parallelograms should be permanent, either in faint red or blue; but probably blue would be the best, so as to be distinguished from the measured lines, which Captain Dawson desires to have retained. All the entire squares must be numbered consecutively, and the broken figures (as where a fence crosses), calculated separately; and it will be evident that, in this separate calculation, the ascertained contents must be correct; for, having the contents of the whole square, its parts added together must of course be the same.

The next subject treated of, is *Subterranean Surveying;* under which head Mr. Bruff gives some useful directions; but is, as under the previous one, far too brief. He has here fallen into an error, against which we must guard our readers, respecting the variation of

the needle, which he states to be at the present time about twenty-seven degrees Westward of North;—whereas the truth is nearer twenty-three and a half. If Mr. Bruff found this variation by the method which he immediately after describes as adopted by practical miners, it is no wonder he has made such a mistake; he says:—

The method adopted by practical miners for ascertaining the variation (for it is not the same in all places), is, to erect a pole exactly perpendicular—its shadow at twelve o'clock will be due North and South, or in the direction of the true meridian; besides the above variation of the needle from the true meridian it has a diurnal variation, which has been often observed to amount to one degree and a half, which may account for inaccuracies that have occurred where the greatest care has been observed in the use of the instrument.

Now it happens that the shadow of the pole can only be *approximately* North and South on four days of the year, and it varies more or less from the meridian at all intermediate times;—we say, *approximately*, because the equation of time, which is the cause of this phenomenon, is not at its minimum (or nothing) precisely at twelve o'clock in long periods of years.

Next follow, methods of protracting and plotting surveys,—reducing figures and equalizing boundaries,—and computing areas.

The next division of the work, consists of a description of the uses and adjustments of the various *Instruments employed in Surveying;* the principal portion of which has been extracted from Mr. Simms's "Treatise on the principal Mathematical Instruments employed in Surveying, Levelling, and Astronomy."

The portion of the treatise which relates to *Levelling*, is by far the best and newest, containing several useful directions and much interesting information. We shall defer making any extracts from this portion of the work, or further remarks upon it, until our next number.

For the present, we conclude with one remark;—although the directions contained in that portion of the work which we have already noticed, are too brief, and generally to be found in most of the other works on Land Surveying, we still consider that Mr. Bruff's work is an improvement on what has been heretofore published.

The History and Antiquities of the Manor-house at South Wraxhall, and the Church of St. Peter, at Biddestone, Wiltshire. Illustrated by Twenty-two Plates of Plans, Elevations, Sections, Parts at Large, and Perspective Views. Forming Part III. of "Examples of Gothic Architecture," Third Series. By Thomas Larkins Walker, Architect. 4to. London: 1838.

Our Journal is not yet so voluminous as to render it necessary for us to inform our readers, that we gave some account of the Second Part of these "Examples" in one of our earliest numbers. What we there said in the way of general commendation, is equally applicable here; the same fulness and perspicuity of delineation—the same scrupulous fidelity to the minutest circumstances, being manifested in this third, and, we fear, concluding portion of Mr. Walker's work. In regard to the meritorious qualities above named, we are acquainted with no other that can come into competition with it; for even those which confine themselves to the illustration of a single building, are almost all, more or less, unsatisfactory;—invariably leaving much to conjecture that required to be elucidated beyond the possibility of misconception. We could point out some remarkable, and not a little curious instances, in proof; and that, too, in works which at first sight appear to contain the most complete information that can be required; nevertheless, when we come to consult them for purposes of study, they leave us utterly at a loss as to a variety of particulars, and in all probability precisely those respecting which we are in search of information. Neither is this very important defect confined to works of an inferior grade, but extends to others both carefully and tastefully executed, as far as mere drawing goes; yet better calculated to please the eye than to furnish lessons of real instruction.

The case is widely different with Mr. Walker's publications: he knows what the professional student requires, and how essential it is, in order to acquire a thorough and accurate notion of any building, that its parts should be shown not only minutely, but completely, so that every circumstance of form be clearly expressed. Unless this be done, the most carefully drawn representations give us only generalities, and are therefore apt to beget a habit of hasty, superficial examination, because they supply materials for nothing further, except what relates to composition. They are even apt to mislead, by suppressing, if not entirely—in a great degree, those particulars of detail upon which the expression of style so much depends. It is to the want of due attention to, and study of, such apparently trifling minutiæ, that we must partly ascribe the poverty and crudeness observable in so many of our modern Gothic buildings and designs, where the expression of detail is quite overlooked, and consequently that of finish also. Were we to say that such things bear no resemblance whatever to the style they profess, it would perhaps be paying them a compliment they do not merit; because, in truth, resemblance enough there is, to make us feel how still greater is the disparity, and how offensive it is. Strange as it may perhaps sound, we are, moreover, persuaded, that to the superficial study of detail is in great measure to be ascribed the want of original ideas; because he who does not thoroughly understand its principles, in the style which he adopts, and the modifications it admits, must of sheer necessity adhere to copying, and feel himself utterly at a loss to give any individual expression to his design, without incurring the danger of departing entirely from the style itself. He is in the situation of a painter who, with no more knowledge of the human figure than what will enable him to people a landscape decently, should undertake an historical piece; which would be like Martin's or Turner's attempting to paint a cartoon.

Considered as documents of style, the subjects here given are more valuable than they may appear to be on first inspection, for neither the house at South Wraxhall nor the church at Biddestone strikes by any great architectural display or richness of character; yet will they be found to contain many valuable elements, of a kind likely to be overlooked where the attention is engaged by what are more obvious merits. The Manor-house is an assemblage of various parts erected at different times, from the reign of Henry VII. to that of James I. inclusive. The hall and porch belong to the first-mentioned period, of which they exhibit interesting and characteristic specimens, not at all the less valuable from their being upon a moderate scale, and having little of positive decoration. The latter of these, deserves to be particularly studied for its sober beauty, and the excellent taste it displays. It is marked by a charming simplicity, resulting not from nakedness or poverty, not from the omission of details, but from those details being treated with gusto, and perfectly imbued with style. This remark applies to the adjoining portion of the building, forming the exterior of the banquetting-hall. The features are exceedingly few, and by no means of a showy sort; there is hardly anything whatever of what modern imitators have recourse to in their designs—not even so much as either string-course or embattled parapet, that *sine qua non* of *their* Gothic; nevertheless the whole is replete with expression, both architectural and picturesque. Its superior quality will be best appreciated by comparing it—we will not say with the generality, but with some of the best modern instances of the style, as applied to domestic architecture; which will, when so tested, be found for the most part flavourless and mawkish. It must, indeed, be confessed, that what we here behold offers no model suitable for direct copying: on the contrary, it will exercise all an architect's taste and ability to produce what shall be equivalent in character, although necessarily greatly modified from the express species here presented to him. This Manor-house, however, sets before us not only much that is truly excellent, but some things also that ought to be avoided: among the latter we unhesitatingly place the interior of the drawing-room, whose outré style of decoration affords a fair sample of that vitiated taste which prevailed in the times of Elizabeth and James;—capricious, yet wearisomely monotonous; costly, yet without richness; finical, yet devoid of delicacy; full of puerile conceits, at once fantastical and frigid; abounding in the most harsh and disagreeable contrasts; and, in short, displaying the most coarse and vulgar taste. Even did we not already know, from what he has said, that Mr. Walker himself will agree in the opinion we have just expressed, we could not prevail upon ourselves to speak otherwise. Still, we do not object to the view of that apartment being given, because we feel that it will justify both him and us, and convince more forcibly than words can do that the style is radically and incurably vicious.

The Churches of London. Nos. XV. XVI. and XVII. By George Godwin, Jun. F.S.A., assisted by John Britton, Esq., F.S.A. London, C. Tilt. 1838.

We have twice before noticed this very interesting and popular work, and have much pleasure in renewing our former expression of satisfaction in it. The views are very judiciously chosen, so as to exhibit well the general effect of the architectural character of the various churches; and the accompanying history and critical notices are particularly interesting. To show the general character of the work, we select the following passage from the history and description of "St. Vedast's, alias Foster, Foster Lane," in the sixteenth number, which begins the second volume.

The interior of the church is divided into a nave and one aisle by a range of Tuscan columns, connected by plain arches, on the south side of the building. The ceiling, slightly coved next the walls, is formed into one large panel, which encloses others of smaller dimensions, by bold and rich

wreaths of flowers and fruits; and the smaller panels contain foliage in a style now much too generally used, namely, the debased Italian, which especially prevailed in France during the reign of Louis XV. but is known as the style of *Louis quatorze* his predecessor.

The altar-piece may be called magnificent of its class; it consists of four Corinthian columns, carved in oak with entablature and pediment of the same material, surmounted by urns, and profusely decorated with cherubim, palm-branches, and other ornaments. In the centre above the entablature is a well arranged group of winged figures, carved in very bold relief around a circular panel; and beneath it is a sculptured representation of a pelican. The figure of this bird occurs in the altar-piece of several of the metropolitan churches: and we will venture to suppose,—in the absence of information touching its introduction—that it was used to typify the Saviour. Until a few years since, it was generally believed, and indeed the opinion is even now current with the vulgar, that the pelican is accustomed to feed her young with her own blood, if unable to procure other food; and so long as men believed this to be the case, the resemblance that this bird afforded to Him who shed his blood for us must have been striking.

Two windows at the east end of the church, (one on each side of the altar-piece, over which is a third,) are covered by transparent blinds painted to represent the delivery of Peter from prison, and the Transfiguration; and we will take the occasion to remark, that the very available means of assisting to give character to our sacred edifices, which painted blinds present, might, we think, be employed with advantage more often than it is, in the absence of funds for the attainment of stained glass.

The general appearance of the interior of the church is much injured by the want of symmetry and regularity caused by the intrusion of the tower, (which stands on the south side of the building at the west end,) and by the introduction of a single aisle. In addition to which, the sides of the edifice do not form right angles one with another, owing probably, to the circumstance, that the architect when rebuilding the church, used all the old walls that were available.

The exterior of the church is represented by the annexed engraving, and is worthy of remark and admiration on account of the original and graceful spire by which the square tower at the south-west corner of the building is surmounted. It is divided into three stories, the lowest presenting four concave faces with clustered pilasters upon piers at the angles. The centre one has four convex surfaces with plainer piers at the angles, and the third consists of an obelisk, or short spire crowning the whole. The parts are simple and harmonious.

In the history of St. Giles', Cripplegate, we are informed that the remains of the immortal author of "Paradise Lost," rest within the walls of this church.

He was buried here under the clerk's desk in 1674; but for many years there was no memorial of him within the church. Through the liberality, however, of the late Samuel Whitbread, Esq. a fine bust of the poet, by Bacon, has been set up against one of the columns on the north side of the nave, with a tablet beneath, (terminated by a flaming sword, the serpent, and the apple, pleasingly grouped,) which bears this inscription:—

JOHN MILTON,
AUTHOR OF PARADISE LOST,
BORN DEC. 1608, DIED NOV. 1674.
HIS FATHER, JOHN MILTON,
DIED, MARCH 1646.
They were both interred in this Church.
SAMUEL WHITBREAD, POSUIT, 1793.

The Monthly Chronicle, No. 3. *Architecture of London.*

THE commencement of this article, which sets out by asserting that literature "might seem to repudiate a union with science and the fine arts"—rather singular doctrine by-the-by—is too obscure and mystified to be at all to our taste. All that we gather from it is, that it is intended, by way of apology, for introducing the subject of architecture "among papers of a purely literary character;" though the apology might very well have been spared, seeing that such topics as "Weather Almanacs," and "Coal Trade Combinations," had been previously discussed; none of which, according to our poor apprehension, can exactly be considered as "purely literary." However we are thankful that this preliminary is as brief as it is obscure, for in the course of a few paragraphs, the writer reaches his subject; yet not till after he has paraded before us the lines of pack-horses, hand-litters, and horse-litters, to be seen in the streets of London of olden times, and now superseded by vans, omnibuses, cabs, and carriages of different kinds, both describable and indescribable. This might perhaps, have very well been spared, for the reason that it occupies space which the writer would have turned to better account by expanding some of the remarks on buildings, which he afterwards dismisses too hurriedly; so that while he proves somewhat lengthily diffuse where he might have been silent, he is provokingly laconic, where his criticism might have been instructive. But the same will probably be said of ourselves; let us therefore proceed at once to give some of his opinions:—

The rapid progress of good taste, may be estimated even by a comparison between Regent-street, and King William-street in the City. Very beautiful in design are many of the individual buildings of the former, and the effect as a whole is striking; but in the latter, a greater unity and simplicity are combined with more real grandeur and fitness, as adapted to their intended purpose. A comparison of Portland-place with Pall-mall, the modern street of palaces, presents a more striking contrast. One great cause of the irregularity of appearance in our streets, has always been the discordant character of the shop-fronts; but these are daily becoming more ornamental, and with a little regulation, easily enforced, their projecting cornices might be made to produce a very beautiful effect.

With the general tenour of what is said in the above quotation, we agree, particularly in regard to the vast superiority of Pall-mall over Portland-place; which latter, considered as architecture, is no better than its water-gruel, not nauseating, indeed, but most insipid. For our part, however, we have yet to learn what are the individual buildings in Regent-street here spoken of as being very beautiful in design. Some of the façades are comparatively good, when judged of by what we observe in their neighbours—many of which are vile enough in point of design—yet among all of them there is not one that will bear the test of leisurely examination. Here and there we meet with some pretty parts, and with something like good composition; nothing farther. All have the appearance of having been erected from hasty unrevised sketches. There is in them a good deal of tawdriness and show, and very little richness; a great deal of poverty and meanness, without any approach to simplicity;—Corinthian fluted pilasters stuck up against "hole-in-the-wall" houses, and other vices of that kind; besides the defect of insuperable littleness arising from the number and smallness of the windows, occasioned in their turn by the want of space within the individual houses,—a defect not at all remedied by the gratuitous introduction of pilasters, which leave no room for dressings to the windows between them. King William-street, in the City, may perhaps be a degree better, but must certainly yield the palm for propriety and consistency of architecture to Moorgate-street, leading from Prince's Street to Finsbury Circus.

Again, we are rather sceptical as to that improvement in shop-fronts, which the writer seems to be of opinion is now taking place. They may, indeed, be more ornamental or ornamented; yet so far from being more architectural, some of the lately erected ones we have noticed are not at all better than their predecessors; for the whole front of the shop is little more than one surface of plate-glass, the actual support of the wall above being within, so that the upper part of the house appears not to rest upon, but to be suspended over, the lower. Why it should be judged indispensable to give the whole extent of frontage to shop windows, it is not easy to say. Most assuredly, the practice is not intended to verify the adage, that "good wine needs no bush;" neither does it seem quite in accordance with what may be considered shopkeeping policy, because where so much show is made at the windows, persons are often spared the necessity of inquiring what articles there may be within. Doubtless every shopkeeper is anxious to make as great a display as he can, and not to be outdone in that respect by his neighbours; yet were all the shops in the same street built architecturally on the same plan, no tradesman could complain, because his shop would at least make as much figure as any of the others. Of course, where the practice complained of is established, it will not be abandoned; but whenever new streets of shops are formed, or extensive alterations occur in old ones, it might be guarded against, just in the same manner that in Regent-street, the new portions of the Strand, &c., persons are prohibited from covering all the upper parts of the fronts of their houses with their names and trades in Brobdignagian letters; in which way the rivalry of tradesmen was at one time carried to a most preposterous extent.

The writer proceeds to animadvert upon the new churches, which he reproaches both with the meanness of their materials and the poverty of their designs. It must be acknowledged, that in such buildings, architects have been greatly cramped by the inadequacy of the funds placed at their disposal; still there is no excuse for the poverty of conception evinced in most of the designs themselves, since the necessity for economizing ought rather to stimulate their invention, and lead them to devise such architectural character and effect as may be attainable without the expensive yet common-place decoration they almost invariably adopt. Only one attempt of the kind as yet, as far as we are aware, has been made, namely, Mr. Pennethorne's new church in Gray's Inn-road; which although not quite so satisfactory as it might have been rendered by a little more study, deserves to be mentioned, were it only as being greatly preferable to the common-place schoolboy *Greek* portico, stuck up against what might else pass for a Quaker's meeting-house. In fact, the latter is of the two by far the less exceptionable, inasmuch as it

is better to exhibit no taste at all than bad taste, and to make no pretensions than to make them only to give evidence of failure.

The writer next passes on to the New Houses of Parliament, and Mr. Barry's design for them, into which he enters at some length; but we shall merely remark, that he is decidedly favourable to it, and also to the site. After this he continues:—"That we *have* failed, failed lamentably, is undeniable," in proof of which he cites the City of London School, "the main front of which," he says, "is the screen of the grand entrance to a baronial hall, caricatured after the fashion of a scene in an Easter-piece, or the opening to a pantomime;"—severe, yet not very unjust censure. In fact, all the detail is excessively poor and insipid, while there is much in the general composition extremely faulty. The National Gallery does not fare at all better, being characterized as "at once the greatest and most obtrusive blunder of the day." That it has many defects, we admit; still we think that its architect has been somewhat too harshly treated, and that sufficient allowance has not been made for the difficulties he had to contend with; and it is questionable whether any of those who have been most violent in their outcries against that edifice would have done at all better themselves, had they been in Mr. Wilkes's situation. That they would have committed precisely the same faults, we do not say; but they would very probably have committed others quite as numerous, and equally great, if not greater.

If we do not agree with the writer in his unqualified reprobation of that building, as little do we accord with him in the praise he is pleased to bestow on Vulliamy's new front to the Royal Institution, in Albemarle-street, which is not only most common-place in idea, but inconsistent in style. As far as the columns go, it may pass for Corinthian, yet the windows, which have the appearance of having been forgotten, and then afterwards squeezed in between them, do not in the very slightest degree partake of the character of the order. In fact, the writer might with equal justice have applied to that building what he has said of the City of London School, it being the classical style "caricatured, after the fashion of a scene in an Easter-piece, or the opening to a pantomime." Before it was doctored by Vulliamy, the front of the Royal Institution was plain, inoffensive, sober-looking, without anything to excite emotion of any kind; but now, though it may pass as fine with the vulgar, it is calculated to excite only disgust or ridicule in those who can judge of architecture besides by book and by rote.

Topographical Survey of the Borough of St. Marylebone, as incorporated and defined by Act of Parliament, 1832. Engraved by B. R. DAVIES, from Surveys and Drawings by F. A. BARTLETT, under the direction of JOHN BRITTON, F. S. A., &c. London, 1834.

THIS is decidedly one of the best published maps of the day. It contains the important parishes of St. Marylebone, St. Pancras, and Paddington: it also shows the extent and limits of the principal landed estates within the borough. It is further enriched with elevations and plans of the principal buildings. We have very carefully examined the map; and from our personal knowledge of the borough, we can recommend it for its accuracy and undoubted utility, to all residents or possessors of property within its limits.

Map of the maritime County of Mayo, Ireland; by WILLIAM BALD, F.R.S.E.

This map is engraved in the first style of the art, on twenty-five plates of copper; it is on a scale of two inches to a mile. The county is in its greatest length seventy-five English miles, and in breadth sixty-four, containing an area of nearly 2000 square miles. Along the foot of the map, extends a section exhibiting the geological structure of the country; and its physical aspect is graphically shown in a series of profiles along the top. The bogs have been levelled and bored; and the harbours on the coast, sounded. The rise and fall of the ground are delineated in detail, and exhibit many instances of remarkable configuration which will be highly interesting to the geologist, as indicating the past revolutions which have disturbed the earth's surface. The survey was conducted by Mr. Bald, the Engineer; and we understand that the surveying and drawing occupied seven years, and the engraving, ten. The result of all this care and labour, is the very splendid map before us: we hear that copies of it have been presented to the Geological Society, and the Institution of Civil Engineers.

We have been favoured with the following particulars of the survey, which we subjoin in the hope of their proving interesting to our readers. The survey was executed trigonometrically: seven base lines were measured, one of them over a frozen lake more than two miles in length. The chain used was made by Mr. Troughton, upon the same model as that constructed for Mr. Heslam for the American survey. The other instruments were, one theodolite seven inches diameter; and two others, five and four inches respectively: two sextants ten inches radius, divided to ten seconds, by Troughton; and another four inches radius, divided to thirty seconds, by Thomas Jones of Charing Cross, pupil of the late Mr. Ramsden. The account of the measurement of the base lines, and triangulation, has been published in the Transactions of the Royal Irish Academy, vol. 14, part I.; with a table of the heights of the hills and mountains, determined trigonometrically and also barometrically.

The Practical Mathematician's Pocket Guide. By ROBERT WALLACE. W. R. M'Phun. Glasgow: 1838.

THAT this little Work appears now in a second edition, says perhaps more in its favour than a laboured encomium from us. We are, however, obliged to confess that we are surprised at the quantity of matter it contains: tables of logarithms to six places of decimals, from 1 to 10,000; of logarithmic sines and cosines, tangents and cotangents, for every degree and minute in the circle; with rules to find secants, cosecants, &c., and the corresponding natural numbers to them all: tables of decimal equivalents; squares and cubes, and square and cube roots up to 100, &c. &c., all in a small pocket volume of 150 pages. Very legibly printed too, and accurately, as far as we may judge from comparing it in a few instances with our copy of Hutton's tables. For a portable and cheap set of tables, we certainly have not seen its equal; its use, however, of course involves more labour in calculation than the larger and more complete collections.

LITERARY NOTICES.

The History and Description, with Graphic Illustrations, of Toddington, the seat of Charles Hanbury Tracy, Esq., by JOHN BRITTON, F.S.A. This work is to contain 25 engravings; and will be shortly published.

Preparing for publication; A Series of Lithographic Sketches on the London and Birmingham Railway, by JOHN C. BOURNE: with Topographical and Descriptive accounts of the origin, progress, and general execution of this great national work, by JOHN BRITTON, F.S.A. It is proposed that this work, which will illustrate the most interesting objects and features on the Line of Railway between London and Birmingham, shall correspond in size and style of execution with the splendid publications of Roberts, Lewis, Harding, and Stanfield. This size (imperial folio) and style will enable the artist to represent many of the Architectural and Engineering features of the works in a manner calculated to give correct information to the man of science, as well as to the topographer and the amateur.

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS—No. 6.

GOLDSMITHS' HALL.

BY this time, my readers will doubtless have found out or fancied that I am not a little fastidious, very difficult to please, and fond of not only pointing out, but descanting upon defects which other critics have forborne even to hint at. I say, "forborne to hint at," because, to imagine that they could not detect them, would be an imputation upon their judgment; whereas, to abstain from censure where it is merited, reflects discredit only upon their honesty. Of good-natured criticism we have had enough and to spare. To art it operates as a slow poison—agreeable to the palate, and destructive to the constitution. However, the question which mainly concerns my readers, is, not whether my observations be good-natured or the reverse, but whether they are sound in argument and correct in doctrine. If it can be shown that they are not, let them be refuted by those who are capable of instructing the public better.

This must of course, it will be said, be intended as a prelude to something more than usually severe. I am going to cut up Goldsmiths' Hall without the least mercy. It will then, be an agreeable surprise and relief to my readers, when I inform them that I intend doing no such thing. There is much in it that is good; much also, that might have been much better. Compared with the old building, it is as "Hyperion to a Satyr;" commanding, dignified, august. To be sure, its situation is not the very best; yet that could not be helped: but then there is one defect connected with it,

which might and ought to have been helped, [illegible] though it might not have been possible to overcome it entirely. The Hall's being placed behind the Post Office, is a matter of comparatively little consequence; because that inconvenience might, in the course of time, have been removed by improvements, which would have converted the narrow lane at the extremity of which it now stands into a wide street opening into Cheapside. It is its front being turned so very obliquely to the Post Office, which is the unfortunate and now irremediable circumstance. It affects both buildings equally, causing them to appear exceedingly shy of each other, and wheeling about in order to escape from forming any acquaintance. Were both or either of them in that flimsy "lath and plaster" style which some veracious critics assure us every one of our modern structures are built in, the mischief would be but temporary; unfortunately however, they are both likely to last for a very long time indeed. Here then, we have an instance of the carelessness or obstinacy with which buildings are erected, without the slighest regard to the further improvement of the situations they occupy; and in fact, so as to be in themselves insuperable obstructions to such improvements taking place.

Considering the building itself apart from this defect, we must admit it to be imposing in appearance, as well from the solidity of its material and construction, as from the magnitude of its features; owing to which latter circumstance, it is far more impressive than most modern works. It is not the heaviness of the enriched parts that we object to; but the insipid tameness, and even meanness of the rest, in consequence of which the whole is thrown quite out of keeping, and a solecism in architectural costume committed, which it might be imagined hardly the veriest tyro could fall into. Upon what principle, I ask, can the architect possibly defend the introduction into the same composition, of two series of windows so totally dissimilar in their character? If he considered that the one required to be so unusually ornamented, how came he to imagine that the other needed no finish at all? He may probably say that the latter are to be considered as those within a basement,—that this is plainly enough indicated by the horizontal stripes along the lower part of the front,—and that it is not very usual to give mouldings or dressings of any kind to windows occupying such a situation. He may set up such a defence; but it can avail him nothing: in the first place, the lower windows are comprised within the order, not in a basement supporting it; and even had they been so, such basement would have required to be much bolder and richer. Not only did the style he has in other respects evidently followed, peremptorily demand it; but the very circumstance of its being rather contrary to ordinary practice, rendered it all the more desirable, as tending to stamp the whole with some degree of positive originality. Even excess of decoration here, would have been the minor fault of the two. He might have enriched the exterior of the ground-floor with rustics, and by means of them alone have given sufficient finishing to the windows; or he might have distinguished them by bold dressings; or, better still, he might have adopted both modes.* Had he done so, the whole would have been consistent; but now—why! his building partakes both of the *perruque* and the *frac*, and resembles a beau in a full-bottomed wig, terminating below not exactly *in piscem,* but in a pair of nankeen trousers. While the upper part of the front decidedly bears upon it the stamp of the old architectural regime, and its stately windows with trophies and armorial bearings above them, carry us back to the days of Roman nepotism and palace-building cardinals; the lower has an air of dapper neatness and spruceness that—I am afraid the reader will accuse me of inconsistency also; at any rate of breaking my word, after giving him to understand that I should find more to approve than to condemn.

Well, let us walk in, let us pass the screen separating the vestibule from the staircase—merely noting *en passant* that it is a feature not calculated to raise our expectations to a very high pitch—and ascend the staircase itself. Here we have undoubtedly a striking architectural scene, a grand flight of steps in front (on the pedestals of which are figures representing the four seasons, by Nixon), and branching off right and left to the upper landing places, or galleries, which have screens of Ionic columns, coupled one behind the other. The columns are of Scagliola in imitation of *verde* antico; and in the centre intercolumn on one side stands a figure of the Apollo Belvidere, on the other one of a Diana. In the three intercolumns formed by the pilasters on the upper part of the wall above the stairs, or that facing the entrance from the vestibule, hang as many portraits; viz., those of George III., George IV., and Queen Charlotte. Above the entablature of the central space, are four arches, filled in with windows; over which is a coffered dome ceiling, from whose centre is suspended a magnificent chandelier. Whether viewed from below or above, the effect is both splendid and scenic, particularly when the spectator stands so as to look quite across, through all the four files of columns.

The Banqueting Hall may be entered from either side of the staircase,—therefore the reader will perhaps say it matters not which. I beg his pardon, it matters a great deal,—a very great deal indeed; therefore, should he ever have the opportunity of entering it at all, let him be especially careful to go up on the right hand side, and so enter it from the south end. He will then be struck—should the apartment be illuminated, almost dazzled—by the effulgence shed from countless wax-lights in lustres that blaze like diamonds, each gem "an empery's price." To describe their effect would almost baffle the powers, and exhaust the vocabulary of George Robins himself, who is unquestionably the greatest of our living poets, and the most imaginative of our living authors. On either side you behold a range of beautiful Corinthian columns with corresponding pilasters behind them; and at the further end, a lofty arched alcove, hung with draperies on which the light is thrown from tapers placed so as to be invisible. There too, we behold Scagliola pilasters, and between them vast mirrors reflecting the columns along the sides of the room. All is pomp and splendour; scagliola, white and gold capitals and entablature, crimson draperies, painted windows illuminated from the outside, noble doors with panels of sculpture over them, and a ceiling of very rich design. But having advanced up to the end of the room, you turn round, and half the spell immediately vanishes. You perceive an oaken or wainscot screen, supporting the gallery at the other extremity; which, though it has Corinthian columns, looks poor, dull, and heavy in comparison with all the rest. It should be observed too that the columns are smaller than the others, and instead of being raised from the floor, stand directly upon it, whereas the general order is placed upon a stylobate about six feet high. How very much better would the effect have been had the architect made the gallery,—since gallery there must needs be,—either behind columns similar to the rest, or if not columns, behind pilasters corresponding with those at the other end of the room, but insulated in the upper part of their shafts, similarly to those of the gallery in the Banqueting-room at Fishmongers' Hall. The architectural character would then have been consistently kept up throughout; whereas at present there is a decided falling off, and in that precise part too, where if possible increased display should be produced. Such most undoubtedly was the case in those halls of olden times, where we find the screen and gallery above it introduced; and which, it may be presumed, the architect of Goldsmiths' Hall had here in view. In these they were the most conspicuous feature, being frequently very richly adorned, while all the rest was left comparatively, if not positively, plain. Here, on the contrary, this portion of the design is such, that instead of in any degree heightening, it detracts from the impression made by the rest, and destroys uniformity, without obtaining for itself any pre-eminence. In short, it exhibits itself as an imperfection and a failure. The architect may be angry that any one should dare to say this; others have greater reason to be dissatisfied with him for having afforded the opportunity of its being said.

The suite of apartments on the other side of the staircase, and occupying the extent of the principal front, does not call for remark on account of anything particular in the mere architecture. They are sufficiently spacious and lofty, and they are fitted up in a costly style befitting the opulence of the company. The artist, whose talents, we here admire, is the upholsterer; luxurious carpets, rich damask draperies, and panels of the same material framed in gold, sparkling lustres, aided by candelabras, and ample mirrors reflecting and multiplying all this pomp of furniture, have their fascination for the eye, and so far impose upon a great many people that they liberally ascribe the effect thus produced to the architect himself, and give him the full credit for it; although he may have no more claim to it than the jackdaw to the peacock's plumage.

ON BUILDING MATERIALS.

NO. II.—LIME.

It is certainly well worthy of remark that, while improvement to a great extent has taken place in almost every other branch of science, the quality of the chief articles used in building should, for many years, have been rather deteriorating; our timber is generally less durable than that which was used several centuries before Mr. Kyan's patent was procured; the bricks used by the Romans are found to this day in a more perfectly sound state than in many of our edifices erected some fifty years since; and the lime and cement employed by the ancients frequently possess a durability which few of the modern inventions have

* One might almost fancy he had never looked at either the street or court front of that part of Somerset House, which adjoins the Strand. Let him imagine for a minute what kind of appearance either of those elevations would make, had its lower story such rustics and windows as those he has chosen to give his own building.

succeeded in rivalling. To this last article, so important in building, I shall confine myself to the few following observations.

Lime, as a substance for cementing together stone, &c. in buildings, appears to have been unknown to the Egyptians and the early Greeks; for most of their edifices are found without cement of any kind. Substances of a similar nature were nowever, no doubt, in use in other parts of the world at a much earlier date; in the Tower of Babel, the sacred historian informs us that they had slime for mortar; and the ruins of Babylon and Nineveh, as described by Mr. Rich, amply attest the fact of the employment of a similar substance.

Approaching however nearer home, and directing our view to less distant times, we shall find numerous proofs of the care and attention paid to this material by our forefathers. The cement used in many of the structures of ancient Rome, remains to this day firm and (to all appearance) imperishable; and the mortar employed in the construction of Richborough Castle, in the Isle of Thanet; Colchester Castle, and several of the ancient buildings of Canterbury and Rochester, is harder than the stone and bricks themselves. From this statement it must be evident that, although much has been said and written upon the subject of lime, but little improvement has taken place in its manufacture; the chief error in most works upon the subject is, that they are by far too abstruse and technical to be very serviceable to the practical man. I have frequently derived more useful information from one hour's conversation with some veteran labourer, whose experience has enabled him to point out in a rude and simple manner the properties of the various limes, than from the perusal of a highly scientific article upon the subject.

Limestone is one of the chief articles employed in the manufacture of lime: and here it should be remembered that, as each distinct kind of stone yields a particular sort of lime, so those limes are the most durable which are produced from the hardest and most durable stone. Portland stone, Bath stone, Purbeck and Painswick stone, each produce a very good lime; and Kentish rag, which is harder still, yields a lime of yet greater strength and durability. The blue lias, now so extensively used in the metropolis, is superior to any of the before-mentioned; it is particularly serviceable for concrete, and for all works that are exposed to the action of water. Its value became generally known by its use in the erection of the Eddystone Lighthouse and Ramsgate Pier, by Mr. Smeaton, where it succeeded after all other kinds had failed. It is produced from a dark-blue slaty stone, which is very plentiful at Barrow, in Leicestershire; I am informed that lately large quantities of a similar kind of stone have been found in Dorsetshire, from which much of it is now manufactured. In Wales, also, stone of the same kind is found, from which lime of somewhat better quality is made, as it is generally better burnt. For concrete, this lime is best; ground fine, and mixed with coarse gravel or river ballast, in the proportion of one part of lime to six of gravel; and it ought to be thrown immediately, and disturbed as little as possible afterwards.

Many years since, Lord Stanhope took out a patent for a newly-invented lime; of its peculiar properties I have been unable to form an estimate, notwithstanding the most diligent inquiry: it is now, I believe, but little in use.

Chalk is another substance from which large quantities of lime are produced. In the south-eastern parts of England this is the principal article from which lime is manufactured; and in London vast quantities of it are used both for public and private edifices. The chalk lime used in London, comes from Guilford, Dorking, Purfleet, Mersham, and the surrounding districts. Very little difference is observable in the quality of these limes; and although they are certainly inferior to the grey stone lime, yet their extensive use by many of our first architects and engineers seems to contradict the common opinion that they are the worst kinds in use.

In Derbyshire the vast quantities of limestone supply lime for all the surrounding neighbourhood; most of it is produced from what is termed the shell marble (referred to in a former article); it is of very excellent quality when well burnt, but is not equal to the Barrow lime of Leicestershire, when used for works exposed to the action of water. It is of an excellent colour, and slakes well; neither does it stain the stone, as many stone limes are apt to do.

Shell lime, although almost unknown in England, is extensively used in some parts of America. I have tried oyster-shells upon a small scale, and found the lime produced stand both water and fire well, but its colour is very indifferent; nevertheless I am inclined to believe that for some purposes it would be found a valuable cement, if properly prepared; its property of enduring heat would render it useful for setting ovens, furnaces, &c.

In some parts of the continent, where marble is plentiful, I am told that large quantities are used for lime, the quality of which is excellent.

It has long been my opinion that the majority of the limes made in this country are [illegible] sufficiently burnt [illegible] been supported by many persons of long and extensive practice. Certain it is, that the goodness of lime depends much upon its being thoroughly calcined; and that lime invariably slakes best which has been longest exposed to the action of the fire. In the manufacture of mortar, I think sea-sand far more valuable than most builders imagine. I am not however aware that this opinion has been entertained by many architects, although it appears that the engineers employed in the erection of the sea-wall at Brighton were of the same way of thinking. The chief objection to the use of sea-sand is, that being impregnated with a considerable portion of salt, it readily imbibes moisture. This may be in a great measure prevented, by laying the sand up in a shed, the floor of which is inclined, and frequently pouring on it large quantities of water, which when it runs off, will carry with it most of the saline particles. In the mixture of mortar, too much care cannot be taken to keep the lime from exposure to the air, as that injures its quality much more than many persons imagine; it ought likewise to be used as soon as possible after being burnt, and slaked before mixture with the sand. The process of slaking and screening is, I think, certainly preferable to grinding; as, by the latter mode, all the half-burnt stones, which form what is called "lime core," are ground up with the lime, and necessarily injure its quality. The mortar for good work should be as stiff as possible, and the bricks or stones well wet previous to setting; the contrary practice is very injurious to the durability of the lime. Road drift, which is often extensively used in the metropolis, is certainly by no means so good as fine sand, as it imbibes moisture considerably; but the mortar made from it stands heat well, and is therefore useful for setting ovens, coppers, &c.

C. L. O.

THE PARKS.

We are about to lay before our readers some remarks upon the Parks of London; and we seize the opportunity, in the first place, of remarking the very great improvements in beauty and convenience, that have recently been effected, and of acknowledging the benefits which latter administrations, but more particularly the existing commission, have secured to the public.

To those who remember the Hyde Park of twenty years past, the difference must be very striking; but even within a very short space of time, it has risen from a barren waste edged round by a narrow road, to a verdant lawn studded with well-disposed plantations, and an arrangement of walks and drives that cannot be surpassed. Kensington Gardens, too, so strikingly described by a celebrated French beauty of the day, as a "Beau triste," has no longer that sombre character. The thinning of the trees, the removal of the lower branches that impeded the circulation of air, the improvement of the walks, and the additional well-chosen approaches to them, have given a new aspect to the scene. The "lungs of the town," to borrow Mr. Wyndham's phrase, have been most skilfully treated.

But if Hyde Park calls up the recollection and elicits the comparison above mentioned, how much more will the present age gain, by comparing St. James's Park with the unadorned sameness of a former day. The genius of Nash has here been most favourably employed; and the kindness of the monarch (George IV.) who directed its opening to the public, must be gratefully felt by the crowds who daily enjoy it. The Regent's Park adds another to these instances of a less exclusive system; and the benefit will be felt in the improved health and morals of the people. By the opportunities thus afforded to the trading and operative classes, the hebdomadal visit to the suburban tavern, or the nightly relaxation of the skittle ground (to be enjoyed by the husband alone on account of its expense), is exchanged for the healthful recreation of the WHOLE FAMILY,—in fields as verdant and in air as pure, as the most opulent can command: and while the privilege thus enjoyed removes a grudge at the benefits conferred by wealth, it thereby effects a moral and physical change equally beneficial.

But though much has been done, some room may yet remain for the exercise of judgment and taste; and we offer our remarks to the attention of the authorities, so competent to appreciate them justly, and to act upon them should they appear deserving of attention.

The suggestions naturally divide themselves into two heads—beauty and convenience.

In Kensington Gardens, the former would be infinitely increased by substituting a light railing for the southern boundary wall, thereby letting in the view of Hyde Park: and the latter would be promoted by enclosing for the use of the residents of the palace, the north-west portion of the gardens by a quick-hedge, removed a few yards, but parallel to the great walk; affording, with no perceptible diminution of the public convenience, a space for private recreation. For the further promotion of the comforts of the residents and of the

public, we would recommend that a gate for foot passengers be opened from the Kensington road on a line with the door at the southern extremity of the great walk. The stream of population would, by this arrangement, be carried *from* the palace; their approach to the gardens from Kensington made more direct; and the quiet of the inhabitants promoted.

In Hyde Park, the most desirable alteration would be to cover, by a brick sewer, the almost stagnant pool (or at least the centre division) at the bottom of the Serpentine river; a delightful turf ride would thus be obtained (which might be called the Queen's ride), parallel to the gravel or King's ride; and a gate opened to it at its eastern angle near the Piccadilly lodge. It should be entirely closed from the end of September to the beginning of May, and the turf carefully attended to. A delightful ride would thus be formed for the ladies, now so generally equestrians, without the annoyance or the danger of contact with carriages.

We would further recommend the immediate removal of such trees as prevent the view from Piccadilly, of the statue erected in honour of the Duke of Wellington. This magnificent work of art—however inappropriate, or however little conveying an idea of the occasion of its erection—is yet too grand in its form, and groups too well with the colonnade, to be condemned to have its form mutilated by the intervening foliage. The trees therefore recently planted in front of it, should be removed; and, at the same time, those at the back should be so trimmed as to allow the profile always to be seen against the sky.

We shall avail ourselves of this opportunity of adding a few words upon this statue. By what authority it was miscalled "Achilles" we are not informed. By the Italian antiquaries, Venuti and Vasi, they (for there are two statues very nearly similar, on the Monte Cavallo at Rome, from one of which this is copied) are called Castor and Pollux; by Flaxman they are termed Bellerophon. But whether Achilles, Castor, Pollux, or Bellerophon, we hope—now that a second subscription has been raised for the purpose of consecrating the triumphs of the Duke of Wellington—that the sculptors of the country will not be insulted by the opinion of the committee of management, that it is necessary to import a copy from the antique. At the time of its erection we boasted the talent of a Flaxman, a Chantrey, a Westmacott, a Baily, and a Rossi: but they were not required to prepare designs; and a statue was erected, bearing no one attribute or symbol that could by possibility identify it with its object. We may too on this occasion, be warranted in giving a hint as to the material. *Of the many, many thousands of statues in bronze which decorated Greece and Italy, not one has been preserved to us;* and it should be a lesson to us *not* to employ a *valuable* material for such a purpose. Where is now the Minerva, thirty-nine feet high, made by Phidias of ivory and gold, holding a Victory in her right hand, the eyes of which, Plato tells us, were precious stones? Where the Olympian Jupiter of Elis, composed of ivory, enriched with a radiance of golden ornaments and precious stones, and esteemed one of the wonders of the world?

The valuable materials of which these works were composed might well become the object of barbarian or civil spoil; but has the baser metal, *bronze*, been more respected. The history of all times denies it. The statues on the Trajan and Antonine columns have been toppled down, and have disappeared; even where bronze has been employed on stone or marble for inscriptions, the letters have been picked out (as in the arch of Trajan, at Ancona) for their intrinsic value. In later times, the statue of Henry IV. which decorated the Pont Royal at Paris, was during the revolution cast into pieces of two sous. Our own capital offers us the same lesson;—the statue now at Charing Cross, was sold during the troubles of the reign of Charles I. for the value of the material, and only preserved as a speculation of the brazier who purchased it.

Is it too great a stretch of fancy to imagine that the statue which has given occasion to this digression, may in the lapse of ages again be cast into cannon to defend our posterity from the attacks of its former owners; or that the Pitt of Hanover-square, the Fox of Bloomsbury, and the Canning of Westminster, may mingle in the same caldron to challenge the admiration of a future age under the form of an usurping tyrant, a goddess of liberty, or a coinage of penny pieces?

As if to impress these truths more stongly upon our minds, we behold in the British Museum the marble statues which enriched the tympanum and frieze of the very temple which enshrined the splendid statue of Minerva above alluded to. Ages have rolled over them; frequent wars have desolated the city of the immortal Greeks, and slavery for centuries held them in chains; but the *marble* yet remains to attest their former greatness, and to prove to all succeeding times, that such memorials should be formed of a valueless material.

The Green Park affords a great scope for improvement, and the means of a very desirable addition to the beauty of this approach to London. The ranger's house and boundary wall should be removed, and twenty feet added to the width of Piccadilly, from Park-lane to Berkeley-street. The slope from the Reservoir to the road of St. James's Park, should be arranged in terraces and enriched with statues, vases, and bassi relievi; and some approximation thereby made to the intellectual character of the continental gardens, the Tuilleries of Paris, the Giardino Reale of Naples, and the Borghese of Rome.

The enclosure of St. James's Park is perfect; but the trees that mask the York Column from the gate of Great George-street, should be removed, thereby effecting the double purpose of opening the Park from the Column, and the Column from the Park.

From this point, (by the paternal attention of his late Majesty, William IV., to his people's comfort and convenience) we ascend Regent-street, through Waterloo-place, to the termination of our subject, the Regent's Park; and we trust we shall be excused the expression of our regrets that the opportunity of forming the most splendid street in Europe has been so entirely lost. With very few exceptions, there is here no building deserving commendation; and the taste which could have sanctioned many of them cannot be too strongly condemned. Magnificent as its whole course might have been, had the line of the High-street Oxford been kept in view, or attention paid to each succeeding vista, we have now no point at which to stop and admire its effect. Passing on to Oxford-street, we have a repetition of the circle at Piccadilly, and in front a church, which, for deformity in design, exceeds anything that has been erected during the last fifty years. As if to make this deformity more monstrous, the church is placed at an awkward angle to the street, thus destroying it as an architectural whole, and making an exposure of the baldness of its flanks and the hideous ugliness of its roof.

From hence we are unexpectedly led into Portland-place, confessedly for extent and regularity, if not for beauty, the finest street in Europe,—but how terminated? Instead of continuing by a broad road, as a principal approach to the Regent's Park, it abruptly terminates in a screen of shrubs, low indeed, but just lofty enough to shut out the view of the Park, and of the Highgate and Hampstead Hills, and to injure by their branches and foliage the bronze statue of his Royal Highness the Duke of Kent. I fear no power exists for favourable alterations in the line of street; but the power vested in the office of Woods and Forests, and so judiciously exerted at the instance of his late Majesty in opening the approach to St. James's Park by the York Column, might with equal propriety be exerted here. The carriage and footway should be continued in a straight line to the opening of the avenue in the Park, and the statue of the Duke of Kent placed on a column on the upper ground of the walk. There would then be something of character at each extremity of the line; and it is scarcely possible that it could be more properly terminated than by statues, of which that of the Duke of York reminds us of a period, when by the indefatigable attention of His Royal Highness, the army attained an efficiency that led, under the conduct of its generals, to universal victory,—and that of the Duke of Kent, to the contemplation of a Prince, who, in the sphere in which he was called upon by Providence to move, displayed a perseverance beyond all praise, in the cause of civil liberty, and the social happiness, and charitable institutions of the country. If the alteration here proposed be thought too large, and the compromise so often and so injuriously made between *what ought to be* and *what can easily be effected*, be adopted; then, most assuredly, should the statue be placed at such an elevation as would secure to it the sky for a background.

In the Park itself, we have little to propose, save the greater accommodation of the public, by opening the remaining enclosed spaces, and the addition of some ornamental architecture, affording an opportunity for placing statues, bassi relievi, and vases in various parts. The quadrupeds have indeed been turned out, and the bipeds turned in, but with just as much attention to the one as the other. The latter walk listlessly about, enjoying indeed the air and exercise; but the intellect is unemployed. The contemplation of the statue of a benefactor of mankind, either of ancient or modern times, or a basso relievo representing an historical fact, would generate a wish to be informed of the history;—the desire of knowledge would induce reading, and such occupation would remove the relish for gross pleasures. The Parks might then become spaces, adapted not merely to help the people to pass their time, but also to put them in the way of improving it; and a government so disposed, might by the substitution of such amusements for the now too much encouraged dissipation of the gin palace, be placed on the sure basis of public opinion and general happiness.

J. H.

EXHIBITION AT THE ROYAL ACADEMY.

THE ARCHITECTURAL ROOM.

Last year, the architectural department of the Academy's Exhibition was, we believe, generally allowed to be greatly inferior to what it had been for many seasons; nor is the present one more than a degree better. There are a few very good subjects; but even all those are not of a kind to afford any evidence in regard to buildings either about to be commenced or actually in progress, there being remarkably few designs for intended buildings of any importance; while there are on the contrary, several drawings of such as have before been made known to the public. For instance Mr. Vulliamy after exhibiting to us last year a large elevation for his new front of the Royal Institution, now gives us a perspective view of the same subject, notwithstanding that it is an exceedingly poor one in itself, and most common-place in its idea. There are, besides, many drawings which although exceedingly showy and captivating for their colouring and execution,—for their brilliant skies, their gay and sunny landscapes, and the effect given them by figures and other accessories, prove on inspection to have very little architectural interest, and do not display anything like equal taste and ability in architectural composition. In some of them, in fact, the colouring is pushed even to extravagance. The artists employed to furbish them up—for it is evident enough that the painter and the architect are not, in these cases, the same individual—have decked them out in dies of azure and purple, gold and emerald, and made them rival peacocks and butterflies. Indeed there are one or two things of the kind that might be still further improved by painting out the architecture altogether, that being the poorest part about them. While instead of being at all opposed to, we would rather advocate, the giving all possible effect and finish to the architecture and its details,—we would enter our protest against the interest of the subject as an architectural one, being either overpowered by or merged in pictorial display and adventitious ornament; whereby what in itself possesses neither interest nor merit, is made to seduce the eye and mislead the judgment. Not only is that which ought to be kept subordinate thus made the principal, and vice-versa, but there is another mischief resulting from the practice here censured; namely, that such specious and gaudily-coloured drawings quite overpower other drawings of a less ambitious pictorial character, and cause them to appear tame and insipid, although far better as designs, and executed with greater attention to correctness and finish of detail. Were there rooms enow to admit of one being devoted to architectural *picture-drawings*, and others to such designs as made no pretensions to rank as specimens of pictorial execution, the latter would not be seen to so great a disadvantage as they now are. In fact if it is intended that they should really be examined, drawings of this kind require a great deal of space, as they never ought to be hung either much above or much below the eye; it is moreover desirable that they should be arranged with some kind of regard to classification as to subjects and style, and not huddled together pell-mell, large and small, *exteriors* and *interiors*, Gothic and Grecian, cottages and palaces, geometrical elevations and perspective views. Any kind of systematic order is however quite out of the question at the Royal Academy, nor do the architects seem at all disposed to emancipate themselves from its trammels, and establish an annual exhibition of their own; which they surely might carry into effect did they care to exert themselves for the purpose, and set about doing so heartily. Still, we conceive, that limited as is the space allotted to architectural drawings at the academy, something might be done for their accommodation, by putting up low screens in the hall against which many of them might be hung up. What objection there could be to this we do not see: it cannot be said that the architectural exhibitors would complain of their works being thrust out of the rooms, if by being so they could be placed where they could be seen far more advantageously than within them.

That a great many cannot now be seen at all, nor would be sought for, were it not for the catalogue, is undeniable; since this happens actually to be the case with the nine first subjects there mentioned, viz., Nos. 1059 to 1067. All these may very fairly be said to be *above* criticism, being placed so high that it is quite impossible to make out what they are, so as to be able to pass any opinion on them. Even 1068 "The Entrance, Hall, at High Cliff," J. Donthorn, cannot be inspected as it appears to deserve to be. We can see indeed that it is a rich Gothic hall, with painted windows, and a lofty roof of carved timber, and that it is paved with marble in large circular compartments; but we cannot venture to speak of the minor features and detail; the kind of examination that would enable us to do so, being quite out of the question.

Nos. 1069 and 1077 are both by the present professor of architecture; but we cannot say that they make the figure the designs of his predecessor were wont to do. No one can accuse Mr. Wilkins of being inordinately ambitious to attract notice by them, both being small, and lightly tinted sepia perspective drawings, exhibiting what we at first took to be the two façades of the same edifice, till on referring to our catalogue we discovered one to be a view of Downing College, Cambridge, the other of the East India College, Haileybury. Yet they are so very much alike that the error was excusable enough. They are very little to our taste; for though it cannot be alleged against them that they are not sufficiently Greek in *their* taste, they betray too pedantic and frigid an affectation of that style carried *à la rigueur*, to show either much invention or happy conception in the application of it. There are a monotonousness and sameness of ideas in them that certainly do not evince an extraordinary stock of imagination.

No. 1071 "The Tudor Seat and Plant Cabinet at Chequer's Court," G. B. Lamb, shows how much may be made of a comparatively small and trifling subject, by intelligent treatment of it, and how much genuine character of the style proposed may be attained with scarcely anything amounting to decoration, and consequently without infringing upon economy. This and the other designs by the same architect, viz. 1126, "The Entrance Lodge at Chequer's Court," and 1142 "A Mansion to be erected in Lincolnshire," display respectively much propriety of adaptation, and a felicity in seizing upon the essentials both picturesque and architectural, of the style they profess to follow. The second, in particular, manifests no small degree of successful invention in the adaptation of the Tudor or ancient domestic style to the purposes of a modern residence; for although there is much in it for which no actual precedent is to be met with, the whole is consistent, the same expression kept up throughout, and consistency of detail—without which there can, properly speaking, be no style—well preserved.

No. 1072 "Interior," Bayley and Easthorpe, although belonging to a class of subjects much too sparingly supplied, is no very great acquisition to the exhibition. The brevity of the title bestowed upon it, leaves us quite at a loss to guess whether it is a mere design, or a view of some apartment; neither is it easy to determine its specific application. As a room, it presents nothing at all remarkable either in form, arrangement, or fitting up. On the contrary, it is not only very common-place in idea, but very exceptionable in taste. The only thing remarkable in it is the ceiling, which must be allowed to be showy enough,—gaudy rather than rich, and manifesting an aim at grandeur utterly unwarranted by any thing else; for there is not even spaciousness or loftiness, nor indeed, quality of any kind to reconcile the eye to the display it affects. Even taken by itself, this ceiling is by no means in the very best taste, having as little to recommend it on the score of elegance, as of economy.

No. 1074 "Cossey Hall, Norfolk," J. Buckler, is a subject, of which many portions have been exhibited before; and such is the variety and play of the building, so numerous are its features, that it may be regarded as a picturesque cluster of architectural studies. This is, perhaps, not the best of the series; still it contains many beautiful features, skilfully combined so as to relieve each other very piquantly.

No. 1076 "Study for the Façade of a Public Building," W. H. Leeds, although by no means a kind of drawing to attract notice, offers one or two peculiarities, more likely to be censured for boldness of innovation than for want of novelty. It shows an Ionic tetrastyle in antis, between two open screen wings of the same order, but not so lofty. It is these parts, however, that lay claim to originality, because the pillars here introduced present a combination hitherto unattempted; their bases and shafts being square, but the necking of the capitals circular, and the capital that of the usual Ionic form. The motive for making the shafts square is apparent enough, their lower part serving as antæ in the screen walls which fill up the intercolumns to about half their height. Such being the case, the only question is, wherefore then not give them corresponding capitals? The reply to which can very easily be imagined, namely that what we here behold has been done with the view of producing something decidedly new in its idea. The drawing itself is not on a sufficient scale to do justice to it; but we think the contrast of form, arising from such combination, would be sufficiently striking and perhaps not offensively harsh, the transition from the square to the circular plan being softened by the curves connecting the shaft with the necking of the capital. At all events a continued square shaft surmounted by the capital of a column is, of the two, less offensive than a column, whose shaft is cinctured at intervals by square blocks; a mode, which besides being not a little ugly in itself, is attended with increased trouble and expense. Another novelty in the design we are speaking of, consists in the tympanum of the pediment being hollowed out more in the centre than at the ends, so the figure in the middle is in full relief.

No. 1083 "Interior of the large Hall in the Building, to be called the Victoria Rooms, Bristol," C. Dyer, is so much above the eye that we can speak only as to its general appearance. This apartment, which, according to a Bristol newspaper, will be 115 feet by 55, and 46 high, offers nothing either particularly remarkable or new in regard to design. The order, which consists of coupled pilasters between the windows, looks rather insignificant when compared with size of the room itself; neither is much effect attempted to be produced by the choice and combination of colours, upon which so very much depends in interior architecture. Another very great difficulty attending a subject like this is the impossibility of showing it as it will more frequently be seen, viz. when lighted up at night.

No. 1085 "Design selected by the Committee for the new Church to be erected on Blackheath Hill," J. W. Wild, is in that very acutely-pointed early style of Gothic, which appears to be just now particularly in vogue for similar subjects, no doubt out of economical considerations, there being neither mullions nor tracery to the windows. Here we observe its peculiar simplicity without any of that meagreness and baldness that are generally so offensive in modern imitations. On the contrary, not only is the character of the details carefully attended to, but there is also a great deal of play and variety in the composition; the east end of the church (the one here shown) having two small towers, (surmounted by spires,) in each of which is a doorway, and between them the polygonal termination of the altar end of the interior, with narrow lofty windows in its upper part.

The next number in the catalogue brings us to one of the most beautiful architectural subjects in the room, "the Loggia of the Villa Madama near Rome, the design of Raffaelle D'Urbino and Giulio Romano," G. Moore. For masterly yet careful execution of an exceedingly difficult subject, replete with intricacy of details and a profusion of gorgeous colours, we have rarely met with its equal. While splendid in the extreme, it is not in the least gaudy; on the contrary it is remarkable for the breadth and repose with which it is treated. This and the drawing, by Haghe, at the new water colour exhibition, representing the interior of the "Hall of the Magistrat du Franc in the Palace of Justice, Bruges," are perfect studies in regard to execution. As

regards the architecture itself of the Loggia, it is that which deserves to be termed *par excellence* the genuine Italian style, showing all its best qualities, and none of its bad ones.

(To be continued.)

COLLIER'S PATENT BOILER.

We have been furnished by a highly respectable correspondent, with the following particulars of an experiment made to test the practical efficiency of Collier's boiler. It is designed particularly for steam navigation; and we may probably in our next number give drawings and a description of its most improved and perfect form. At present, we need only state that it is contrived with a view to exposing as great a surface as possible to the direct action of the fire, at the same limiting to the utmost the whole space taken up by the boiler. Great attention is also paid to the saving of heat usually lost by radiation; the chimney is surrounded by a jacket incasing its lower part, and containing the feed-water to supply the boiler; and the whole boiler is encased in a jacket of wrought iron, the intervening space being filled up with clay and charcoal, forming a good non conductor. Thus it will be seen that Collier's boiler conforms to some of the most important of Mr. Dinnen's suggestions which we have mentioned in another part of our Journal: the invention was patented considerably previous to the publication of the new edition of Tredgold, in which Mr. Dinnen's suggestions appeared: so that the striking coincidence between the two, proves plainly the practical utility, both of the suggestions of Mr. Dinnen, and of the invention of Mr. Collier.

The experiment, the result of which we are about to relate, was made with a boiler adapted to a fixed land engine of twenty five horse power, manufactured by Mr. Collier, at the Globe Dock, Rotherhithe, where also it is in use. Its dimensions are as follows:—

	Ft.	In.
Length	8	6
Breadth	3	8
Height to top of steam chest	9	6
Height to water line	7	6
Height of feed pipe to water line	9	6
Height of safety pipe to ditto	11	6
Evaporating surface—		
Four chambers	120	0
Crown of furnace	15	0
Two sides of furnace	50	0
Take up, bridge, &c.	65	0
Total feet	250	0

exposed to the action of the fire: which, at about ten feet per horse power = 25. Surface of fire bars 32 × 30 inches = 960 square inches; or 38·4 square inches per horse power.

The coals used were the ordinary Newcastle, of the quality generally burnt under boilers. The water for feeding was drawn from a well on the premises, into an upper cistern the contents of which had been accurately measured, and which when filled was allowed to run out into a lower cistern, whence it was pumped by hand into the jacket before described as containing the feed-water. This was uniformly kept full, and remained so at the end of the experiment. The temperature of the feed-water was then about forty-two degrees. The boiler having been at work the previous day, the fire had been banked down at night as usual. This fire having been broken up, without the addition of any more fuel the steam rose in eight minutes and a half to a pressure of four inches by the mercury gauge; at which height, or varying between that and five inches, it was kept steadily during the experiment. 1132 lbs. of coal were weighed to the stoker, who was watched closely, and kept up the fire in his usual manner. After nine hours trial, the fire on the bars being as nearly as possible in the same state as at the commencement, the experiment terminated; when the quantity of coal remaining was 260 lbs. Thus, there had been consumed

872 lbs. of coal, to evaporate 836 gallons of water, or 134·83 cubic feet,
or 1 lb. . . . . 9·58 lbs. "
or 6·47 lbs. . . . . 1 cubic foot "
or, the boiler being assumed to be twenty-five horse power, 3·428 lbs. per horse power per hour.

The boiler appeared to be very steady in its action, and the evaporation was very uniform. The stoker fired very thin and frequent charges; by far too frequent for the economical use of fuel. The coal seemed well consumed, and did not form any considerable quantity of clinker, as might have been expected from the mode of firing.

At the termination of this experiment, a trial was made of a simple contrivance adapted to the boiler, with the view to prevent either explosion or collapse. This contrivance we will shortly explain now, but our drawings hereafter may probably exhibit it more clearly. A pipe opening into the chimney at an altitude calculated for any given pressure, descends through the water space to within six inches of the bottom of the boiler. On any extra pressure of steam acting on the water, it is forced up this pipe into the chimney, where it falls into, and stops up the take-up: and, if the pressure continues notwithstanding the check thus applied, the water rises through the take-up into the fire and extinguishes it. In case of any tendency in the boiler to collapse, the action of this pipe would be the reverse; the atmospheric air would be allowed to enter from the chimney, and thus the formation of a vacuum would be prevented. Such is the contrivance: to test it, a weight was applied to the lever of the safety valve till the mercury rose to six inches and a half, when the water was forced up, and the fire extinguished. As calculated to prevent dangerous accidents, this arrangement seems worthy of general adoption: its success in this experiment was certainly complete; the fire being extinguished, as it will be seen, on the mercury rising an inch and a half, or two inches at most, above the height at which the engine had been working.

CEMENT AND TILE ROOFS.

Sir,—Your past notices of several new and useful inventions and improvements applicable to the practical part of the profession, induce me to offer the following remarks on a form of roof, not absolutely new, but little known, which recently came under my observation; the application of which, if attention be directed to it, is likely to supersede in many cases timber roofs, and may also be of great service in lieu of arched brick floors, &c.

The roof in question, covers a small building twenty four feet by twelve. On the top of the one pair walls, are laid iron plates, bolted across by iron rods; from these springs a segment roof, (versed sine 3 feet) composed of three courses of strong plain tiles in cement. It is capable of sustaining several tons pressure, and as solid as the walls themselves;—perfectly fire-proof, air, and water tight: but to give ventilation, two nine-inch gratings are inserted in the gables.

This instance must not however be taken as a just criterion of the capabilities of this form of roof; but rather as a fair specimen of its complete success, and as a proof that it is applicable to a much greater extent. Messrs. Newman's livery stables are I believe covered with a roof of this construction: the span is between thirty and forty feet, and carriages and other great weights are allowed to pass over, and are suspended beneath for repairs, without the least perceptible injury.

Upon the whole, this roof seems applicable to many uses in building; and if it be required for any extraordinary degree of strength, by placing slips of iron hooping between the courses, almost any degree of strength may be obtained. Its lightness will recommend it in many instances, where arched brickwork would be objectionable from its weight; besides allowing of a greater height between the floors. It may be used to advantage for fire proof rooms, and for endless other uses, which occur only in practice.

The roofs above mentioned were executed by Mr. Ritchie of Paddington, who appears to be the only builder who has turned his attention to this form of roof; though for some years they have occasionally been constructed flat, supported on iron girders and bearers.

I will not occupy more space in your valuable journal; but trusting this brief communication may find a place among your correspondence,

I am yours, &c.

London, May 18, 1838. C—.

[We can testify to the correctness of our correspondent's opinion, having adopted tiles and cement for flat roofs with great success: and we confidently recommend this mode of construction in preference to lead flats, where there is likely to be traffic over the top. We have also seen circular roofs constructed as described in the above communication, which have fully answered the purposes intended.]—Ed.

DUTY AND INTEREST OF CANAL PROPRIETORS.

At a period when energetic and extensive efforts are being made for the formation of railway communications, it is imperative upon the committees and proprietors of canals to come forward and render their respective navigations as perfect as possible. Many of the canals have remained in nearly the same condition for several years; are needlessly circuitous; are in a defective state of repair in their locks, towing paths, and tunnels, which latter are small, inconvenient, and even dangerous; are inadequately supplied with water, and require deepening and cleansing. It is most important that these defects should no longer remain; and that by a liberal but not improvident expenditure, the several canal works of whatever kind should be rendered effective to the increased and increasing wants and trade of the country. It cannot otherwise be expected that canals will maintain their present position, against the formidable rivalry now organizing in the midst of them.

The canal proprietors in their several districts who are so much interested, whether as shareholders or as trustees for distant parties, are bound to attend to the efficient state of the canals in their own neighbourhood; and where there does not exist in the local committees energy or inclination to effect essential improvements, it becomes the duty of the proprietors themselves, at their annual meetings, to elect such persons as are alive to the present state of canal affairs, before they irrevocably lose that portion of their trade which proper attention may now permanently secure. Good management is become an indispensable requisite to every canal company.

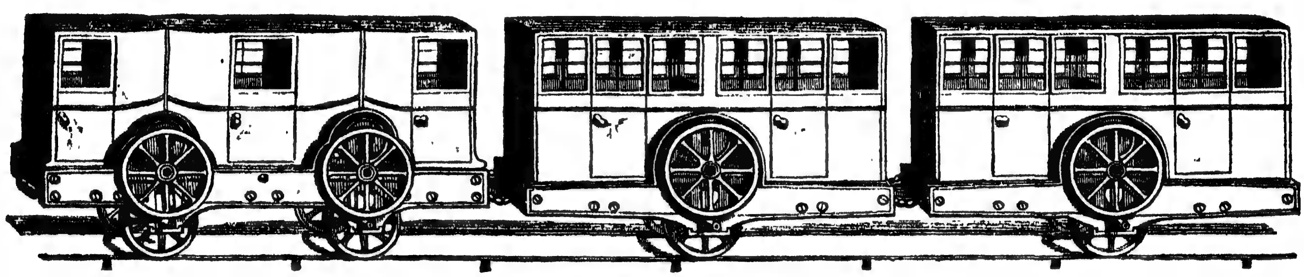
Upon some of the canals the trade is much fettered by compensation and junction tonnages, conceded in the infancy of these undertakings to the influence of opposing parties; the canal companies so circumstanced will do well, in a friendly and conciliatory spirit, to meet and arrange these antiquated modes of deriving income, and thus place their tonnages upon sound and rational footing. They will also act wisely in abolishing such local arrangements as are vexatious to the trader, and often without benefit to themselves, are injurious and irritating to the companies immediately

connected with the trade of their district. Canal companies must have no petty jealousies, but unite in affording every facility to the transit of the trade of this increasingly commercial country.

The writer of these observations is so strongly impressed with their importance, that he hopes they may commend themselves to every canal proprietor; and produce some effect upon the practical operations of every canal committee general meeting in the kingdom. Z.

[In one respect we differ from our correspondent, though we cordially assent to his doctrine that the present are not the times for canal proprietors to differ among themselves, or to be careless in their attention to the interests of those who have business on their several lines. We hope indeed that *few* canals have been constructed in situations where there is not sufficient traffic in *heavy goods* to enable them still to continue their operations with profit to their proprietors and advantage to the public. Where such is the case, the experience of the Liverpool and Manchester line is sufficient satisfactorily to prove, that with constant attention to punctuality and speed, the canals may still flourish. Yet, we fear, there are cases enough of a different character to warrant us in dissenting from our correspondent's opinion that "the several canal works of whatever kind should be rendered effective," &c. A sound discrimination, in short, should be exercised: where a railway is projected parallel to the line of a canal which does not at present pay, and is not likely ever to do so, the proprietors would do well to consider whether they might not dispose of their land wholly or in part to the railway company. And where this is impossible, rather than incur additional expense by engaging in a hopeless contest, prudence would suggest the endeavour to make their canals useful in some other way. In some cases, especially where they have large reservoirs in high grounds, might they not be converted into channels for water works, and made to supply public baths on a large scale for neighbouring towns? In agricultural districts, might they not occasionally be profitably employed in irrigation? These hints we throw out with a view to helping to mitigate the inconveniences, which must ever attend a change so vast as that introduced by the Railway System. So it always is; one improvement pushes aside the improvement which just before had superseded its predecessor: canals must now partially yield to railways; and railways themselves must quit the field when some superior invention shall appear to supersede them. Still they will have their day;—*and we rather think it will be a long one.*—Ed.]

COLES'S PATENT FRICTION WHEEL CARRIAGE.



The improvement specified, consists of a frame with a groove about half way up, in which are fitted two nuts or collars working up and down in the groove; in these collars the axles of the ground wheels revolve. The axles of the ground wheels, and of the large friction wheels, are fixed, and revolve with their wheels. But the axle of the upper friction wheel, is fixed into the frame, and screwed at the back, the wheel working round it. There is also a brace, to support the axle, and keep the wheel in its place. The axle of the ground wheel gives motion to the large friction wheel; the upper axle is met by the rim of the small friction wheel. Thus the friction is transferred from the wheel with the quick motion to that with the slow motion; the latter makes only one revolution whilst the former makes sixty. The consequence is, that where you have all the friction, there is no weight; and where you have all the weight, there is (comparatively speaking) no friction.

Another part of this invention I conceive to be equally novel and important. There is an elliptic spring buffer, acting between two cross stays upon which the springs of the carriage have their bearings; the advantage of which is, that it cannot be strained when pulling or buffing, as the spring buffer yields both ways, thereby preventing any sudden jerk or concussion. By means of a strong connecting rod made to fit the spring and fastened by a pin, is formed a continued string of rods and buffers throughout the whole train. This mode of connexion is of course indispensable when two-wheel carriages are used, and it completely obviates all tendency to tilt either way, however unequally the carriages may be loaded. There are also side chains connecting the carriages; each chain has a dovetail fastening at one end, and a spiral spring at the other. The spring will extend when the carriages turn out of the straight line; as they pull from two bearings when turning either way, and from all three when going straight forward.

The two-wheel carriages appear to me to possess a decided advantage over those with four; they are not designed to be used singly; but to be joined together in a train. My friction-wheel carriages, whether two-wheeled or four-wheeled, are evidently adapted for use with any kind of power, whether steam, horse, or hand. To test the value of my invention I have constructed various models, to which I have given motion by means of two clock-springs acting upon the ground axle of the first carriage. With this apparatus, I have made many experiments, and obtained highly satisfactory results. So that I do not hesitate to assert my belief that the above carriages will carry any weight, with less than half the power usually employed; or that they will travel twice as fast as carriages of the ordinary construction, if the same amount of power be exerted. The public however, will have the opportunity before long, of ascertaining this point for themselves, at the Adelaide Gallery; where the models will be set at work daily at twelve and four o'clock.

3, *Charing Cross.* W. COLES.

CURTIS'S TIMBER FRAME RAIL.

In laying before your readers a description of my timber frame rail, which I carried into effect in Mexico, on a large scale, in the year 1835, and of which the accompanying drawing is a perfect representation, I cannot do better than state my experience of the exceeding value of the cross sleepers, or ties; as their use has been publicly called in question by an engineer, whose opinion is entitled to some deference. The railway in question was laid down the side of a hill, at an angle of 30 deg. I cut into the hill on one side, and the outer side, or wall, was formed with stones, *cemented* with mud: a usual mode of building rough walls in that country. The void left between the wall and hill was filled in with the debris of the rock, resulting from the side cutting; the frame was laid upon this seating, the outer end of the cross timbers resting upon the wall; and the rails were packed up with the rough stone. Although this embankment, if I may so term it, was formed of the most loose materials, yet such was the security produced by the continuous frame, that during my residence at the mine, it never failed once; and I have received advices during the latter part of the past year, that it answers perfectly. The machine of which it forms a part has also been at work from the day I set it in motion, without any material accident. The great value of a timber frame rail is, that it forms a kind of web, which—laid upon the top of an embankment—tends to hold it together; because a train passing over it cannot affect one part without the contiguous parts bearing a certain proportion of the load. The effect of a train passing over a timber, or a rail and stone blocks without ties, is to press them into the soil vertically, and the timbers or stones act as wedges to push out the soil, and to cause those side slips which so frequently take place upon a new embankment. But the effect of a train passing over a timber confined by transverse ties, is very different; the ties in this case act as the radii of circles, of which the outside rail on the opposite line of rails is the centre. The effect then of the load will be, to press the rails in the direction of the circumference of the circle, or towards the centre of the embankment. Again, in the event of a slip taking place, a timber without ties would be pushed outwards by the wheels, and the train would run off the line, and in fact the rails have a perpetual tendency to get out of gauge; but when confined by ties, this is not the case; and if a slip does take place, the rails remain in a comparatively perfect state. It is objected to the cross ties that, inasmuch as they form a more solid bearing than is obtained at the intermediate points, the line is soon formed into a series of undulations; but any person of the least discernment who has noted this circumstance, ought to have seen the remedy in the defect itself; it only requires that the cross ties should be placed at less distances from each other. In my rail, I always place the timber on the edge; because, in the first place, its stiffness is as the square of its depth—so that what is lost in a narrower bearing surface, is more than counterbalanced by the stiffness of the timber; and, besides this, it enables me to form the joint in a more advantageous manner. In cases where the timber is very long, I place two, or three, or more cross ties between the two corresponding rails, and not across the whole four.

Fig. 1.

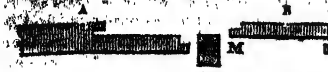


Fig. 2.

Fig. 3.

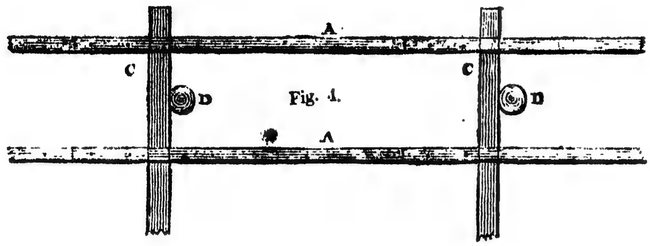
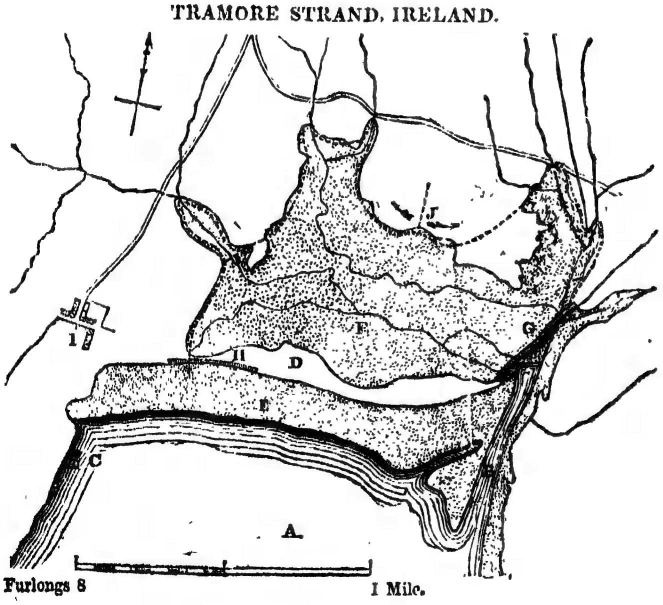


Fig. 4.

The construction of the rail will be readily perceived by reference to the engraving. Fig. 1 is a side view of the end joints of the timbers A and B; the tongue of B enters the notch of A, and the two tenons, one in each timber, enter the mortice M of the cross tie C, and meet midway, forming a joint, as shown in fig. 3, which is a side view of the rail. When thus formed, two pegs or trenails, shown by the dotted lines, are drawn through the joint, and it is finished. Thus the two timbers and cross sleeper are united at one operation, and in a manner so perfect, that they can never twist or get out of shape; and one timber has a tendency to correct the twist of the succeeding one. Fig. 2 is a front view of a cross tie, with the mortices for the tenons of one line of rails. Fig. 4 is the plan of the frame; A A are the rails; C C the cross ties; D D are piles or wedges of hard wood, which I let into the rock, to prevent the frame from sliding down the hill. I had no notion of using them otherwise than as stops, and not to hold down the frame to the ground; this idea is due alone to Mr. Brunel, and I have no doubt will be found exceedingly useful. W. J. CURTIS.

1, *Stafford-street, Bond-street.*

TRAMORE STRAND, IRELAND.



References to the Map.

A, Tramore Bay as it appears at low water.—B, Rhineshark Channel.—C, Proposed Pier.—D, the Burrow, or neck of land, dividing the Front and Back Strand.—E, Front Strand of Tramore, which is covered at high-water.—F, the Back Strand, now covered at low-water, which it is proposed to embank in, and thus reclaim.—G, Embankment to be made.—H, Sea-wall to be erected to strengthen and protect the narrow and weaker portion of the neck of land between the two strands.—I, the town of Tramore.

The dotted lines show the new catch-water drains which it is proposed to construct, to carry off the water flowing from the rivers. The summit level of these drains is at J, from which point they fall to the East and West, as shown by the arrows. The Eastern drain discharges itself at the embankment G, just below high-water mark; and the Western one flows out at the sea-wall H.

Extract from the Report of William Bald, Esq., Civil Engineer, for embanking and reclaiming 1,425 Acres of Land.

"The Back Strand of Tramore is, in strict geographical language, a gulf; but at low water it is dry. It is connected with Tramore Bay by the Strait of Rhineshark, which is 322 yards broad at high-water spring tides, and 113 yards wide at low-water. This strait and channel bear seaward from the Pool of Rhineshark S.S.W. ¾ W.

"The south side of Tramore Back Strand is defended from the run of the ocean by a very remarkable spit or peninsula of land, two and one quarter English miles in length, commencing on the west side, within three furlongs and a half of the town of Tramore, and extending to Cape Ottrington at the Strait of Rhineshark. This peninsula is, in its narrowest part, 170 yards wide, and is only about five feet six inches above high-water spring tides, and on the surface consists of shingle. In its extreme breadth, it is 480 yards across, consisting of sand-hills rising from twenty to fifty feet high. This peninsula, on the sea side, presents an immense beach, consisting principally, on the surface, of sand and shingle, but in several places underneath, clay, and even bog is found, containing trunks of trees.

"The Back Strand of Tramore contain 980 Irish acres, or 1,588 English acres. The surface of all the upper creeks consists of beds of mud, and a very considerable portion of the Back Strand is covered with rich alluvial deposits, combined with marine exuviæ; but towards the Rhineshark, the surface is composed of sand. In several places, considerable quantities of cockles are to be found. The nature and extent of the whole surface of the Back Strand, with the strata underneath, have been minutely described and set forth in the Map which accompanies the Report, and the various rivers and channels by which it is intersected, and also the depth of water over it at high-tide, has been stated.

"Adjacent to the Back Strand, on the coast edge of the church lands of West Kilmacleague, are 40 acres, 1 rood, and 21 poles of marsh land; 20 acres, 2 roods, and 30 poles in the lands of Lisselan; and 5 acres, 3 roods, and 12 poles in the lands of Ballynattan. These pieces of ground containing 66 acres, 3 roods, and 13 poles Irish, or 108 acres, 1 rood, and 1 pole English are covered by the sea at high-water, but could be readily converted into excellent productive land if embanked in from the influence of the high tides. These marsh lands consist of compact bog and alluvial deposits; the retentive nature of this kind of soil would form one of the best and most permanent puddles that could be used in the construction of engineering works, such as hydraulic dykes, and particularly where embankments require to be made quite impervious to water.

"There are on the Burrow side of the Back Strand of Tramore 46 acres, 2 roods, and 16 poles Irish, or 75 acres, 1 rood, and 37 poles English, of ground called marsh, covered by the sea at high-tide; but it is a soil of a light nature, consisting partly of alluvial deposits mixed with sand.

"The Back Strand of Tramore is surrounded on the east, north, and west, by an arable country, undulating and moderately high; and as the quantity of water flowing into the Back Strand from the adjacent country is an important element connected with the proposed drainage and embankment, I have, therefore, made the following calculations of the quantity.

The Width, Depth, Velocity, and Sectional Area of the Rivers and Brooks running into Tramore Back Strand, as measured on the 26th of January, 1838.

	Breadth of Rivers and Brooks.	Depth of Rivers and Brooks.	Mean Velocity of the Rivers and Brooks.	Sectional area of the Rivers & Brooks.	Quantity per min. Cubic feet.
	F. D.				
1. Crobally	21. 0	0.333	Weir 21 ft. wide	6.93	257
2. Pickardstown	4. 0	1.333	34 ft. 5 in. in 22sec.	5.32	500
3. Drumcannon	2. 0	1.41	6 ft. in 8 sec.	2.82	126
4. Cuilla	4. 0	0.50	15 ft. in 7 sec.	2.00	257
5. Lisselan..........	3. 0	0.333	14 ft. in 21 sec.	0.99	39
6. West Kilmacleague	2. 41	0.25	12 ft. 5 in. in 10 sec.	0.60	45
7. North Ditto	10. 0	0.50	23 ft. in 10 sec.	5.00	690
8. South Ditto	5. 5	0.25	11 ft. in 10 sec.	1.37	90
				25.03	2004

Thirty-three cubic feet per second. The mean quantity daily given by the general calculation, as stated in this Report, is twenty-five cubic feet per second.

"The velocity of the surface of the sea-water in the middle stream at half-flood spring-tide, running inwards to the Back Strand through the Rhineshark Channel, on the 27th January, 1838, was three miles and 480 yards per hour, or 4.80 feet per second. And the velocity at half ebb spring-tide, running outwards from the Back Strand, through the Rhineshark Channel, on the 29th January, 1838, was three miles and 1432 yards per hour, or 5.59 feet per second.

"The greatest depth of water found in the Rineshark Channel at low-water, on the section taken across, was 13.7 feet; and 25.7 at high-water.

Sectional Area at low-water	. . . .	2,924 superficial feet.
Sectional Area at high-water	. . . .	11,004 superficial feet.
Mean hydraulic depth at low-water	. .	8.54 feet.
Ditto . ditto at high-water	. .	11.92 feet.

"Taking the area of the Back Strand at 980 Irish acres, and assuming the mean depth of the water from the soundings and levels at five feet at ordinary spring-tides high-water, there will be (70560 × 5 = 352800 × 980)

345,744,000 cubic feet of water, with which the Back Strand is filled twice in twenty-four hours during ordinary spring-tides. Although this water does not consist wholly of sea-water, yet the influx of so great a quantity of water into the Back Strand must cause a considerable indraught into Tramore Bay, which seriously affects ships falling within the headlands of Brownstown and Newtown; indeed, so much so, that a vessel has never been known to be able to work out again, when once unfortunately within the influence of this indraught current. Therefore, the construction of any works that would diminish this indraught into Tramore Bay, and prevent the frightful loss of life and property incurred by the wrecking of so many ships within Tramore Bay should be hailed as a national advantage to the shipping interests of the empire. The shutting out of the tidal waters from the Back Strand would diminish to a great extent the indraught into the Bay of Tramore, so dangerous to the mariner.

"The Harbour or Pool of Rhineshark contains at low-water an area of about six acres, and a depth from eight to thirty-five feet, with good holding ground, and is well sheltered. There are several fishing-hookers belonging to this harbour; they generally lie in a creek three-quarters of a mile above the Pool of Rhineshark, between East Kilmacleague point and Carbally, and which place is dry at low-water. The length of the channel from the Pool of Rhineshark to its entrance seaward is one mile and three furlongs. The depth of water on the Bar at low-water spring-tides is about one and a half feet. The entrance is narrow and difficult, being neither marked by buoys nor perches, and should never be entered by even small vessels without having a pilot on board.

"Having described the extent and nature of the soil of the Back Strand of Tramore, the average depth of water on it at spring-tides, the quantity of water flowing in upon it from the high land which surrounds it, and the velocity of the sea-water flowing in and out at half-ebb and flood spring-tides, through the Straits of Rhineshark; also the sectional area and mean hydraulic depth at high water and low water, at the narrow entrance of Rhineshark; it is now necessary to describe the situation and nature of the works to embank in the Back Strand of Tramore.

"An embankment across the Straits of Rhineshark would be shorter than any other embankment which could be constructed to shut out the tidal waters, but its construction would be attended with great expense, difficulty, and risk, on account of the strong and powerful current through those narrow straits. Such an embankment across the Rhineshark at Cape Ottrington would entirely destroy the Pool and Harbour of Rhineshark, which it seems to be so very desirable to preserve, if it be possible, in any plan for embanking in the Back Strand. I have, therefore, proposed to construct an embankment from near Cape Ottrington to the east point of Kilmacleague, as drawn on the map, and which will leave the present Pool and Harbour of Rhineshark open, so that boats can still lie up in the creek between east Kilmacleague and Carbally. The extent of the Back Strand inside this embankment, including marsh land, will amount to 1,425 English acres. This proposed embankment is 1,325 yards long, twenty feet wide at top, and armed in front with a stone wall or pavement battering. It is proposed to have two or more sluice gates to discharge the land-waters into the sea during low tide; but before constructing such an embankment, it would be desirable to lay down a rough rubble stone dyke in the line of the proposed embankment, only a few feet in height, which would cause an accumulation of alluvial deposit behind it on the Back Strand; and one year's trial would show the amount of this deposition, which in my opinion would be found extremely valuable in enriching the surface parts of the Back Strand, where sand exists. In Holland, stakes are driven down in the line of the proposed embankment, and a kind of fence is constructed with willow twigs and branches of trees, a few feet in height, by which the floating alluvial matter is intercepted and deposited on the land intended to be embanked in; by this mode of proceeding, the surface is not only raised higher by these accumulated deposits, but forms a soil of the richest and most productive kind.

"In order to prevent the sea from flowing over the shingle beach into the Back Strand, and also to strengthen and secure the beach more effectually from the inroads of the ocean, I have proposed that a rubble pavement should be constructed, sloping seaward, and secured at the toe with a row of small sheeting piles; the lowest portions of the beach need only be secured, which is about 880 yards long, but the whole length is 1500 yards.

"At the western corner of the beach a small tunnel and sluice gate is proposed to be constructed, to discharge the waters from the catch-water drain, and which will receive the waters from the high land which bounds the Back Strand on the west side. It is intended to surround the whole Back Strand with a catch-water drain, to receive the waters which may flow in from the high land which surrounds it.

"All the parts of the Back Strand which are covered with mud will become extremely productive land; and even the parts which are of a sandy nature can be fertilised and covered with alluvial depositions, by confining the fresh water upon it for some time, as already described. There are about 324 acres of mud; 686 acres of mud and sand, mixed; and 232 acres of sand and gravel; which I would value at the following rates, annually, after being embanked in and under cultivation:—

ACRES.		£	s.	£	s.
324	of Mud	at 2	0	648	0
686	of Mud and Sand	at 1	10	1029	0
232	of Sand and Gravel	at 1	0	232	0
				£1909	0

ACRES.		£	s.
	Brought forward	£1909	0
108	of Marsh land	216	0
75	of Ditto	75	0
1425	Total English Acres.	£2200	0

"Looking at the facility which the physical structure of the shore presents to embank in Tramore Back Strand; at the elevation and rich nature of its soil; its fitness and capability from practical experiment to produce a succession of the most luxuriant crops for a long period of time without manure; the climate so favourable to vegetation; its contiguity to the market of the city of Waterford; and, looking in general at the immense return and value of the lands embanked in from the sea, both in Great Britain and on the Continent, compared with the outlay of capital,—all this satisfies and assures me, on considering the various circumstances, that the Back Strand of Tramore would more than amply repay the capital invested in embanking it in and improving it. No part of the sea-lands of Ireland offers a more inviting field to repay the industry and enterprise of man; it would also afford employment to the labouring classes of a more useful and permanent character than the construction of a railway, a canal, a harbour, or a road. Those useful and national works, the accompaniments of extended trade and wealth, create, during their execution, a very considerable number of labouring men, but who are left frequently without employment when those works are completed: whereas tracts of lands when drained and embanked, not only give useful employment during the execution of those operations, but they also afford permanent employment to labouring classes in the general cultivation of the land so drained or embanked, and it is in this respect that works of drainage and embankment are more pre-eminently calculated to benefit the poor in affording useful and *lasting employment* than either harbours or canals, &c., &c.

"The sea-lands covered with mud which have lately been embanked in from the sea, in the estuary of the Forth, on the estate of Lord Dundas, in Scotland, have been valued at five pounds per acre. It has been stated to me by the agent, that those lands will give twelve crops of wheat without manure; and it even has been asserted, that this sea-mud land is so rich that it would give alternate crops of wheat and beans for twenty years without requiring to be manured; 300 acres have been embanked in at a cost of forty pounds per acre; and there are about 1,300 acres capable of being taken in. The embankment constructed is eighteen feet high in several places, and has been faced with stone. In Scotland several tracts of sea-land have been recovered from the sea, and also lakes drained, which are unnecessary to detail; and even some of them in the most remote parts of that country, viz.: in the Isles of Islay, North Uist, and Borcray; these tracts have most amply repaid the expense of embanking. On the Continent, lately, the Polder of Snaerskerke, near Ostend,* containing 1,300 acres, was embanked in from the sea; it was afterwards divided into fields of about thirteen acres each, and it is now worth more than sixty thousand pounds sterling."

Estimate of Embanking in the Back Strand of Tramore.

	£	s.	d.
WORK ON FRONT BEACH.			
880 lineal yards of beach to be raised and armed with stone, 20 yards broad and $1\frac{1}{2}$ feet thick, $880 \times 20 \times .50 = 8,800$ cubic yards, at 4s.	£1,760	0	0
880 lineal yards of piling along toe of paving, each pile, 7 feet long, 4 inches diameter, 9 piles to each lineal yard, 7,920 piles at 1s.	396	0	0
Tunnels, with sluice-gates through the beach	350	0	0
EMBANKMENT FROM NEAR CAPE OTTRINGTON TO EAST KILMACLEAGUE POINT.			
1,325 lineal yards of embankment, 5 yards high and 12 yards broad, $1,325 \times 5 \times 12 = 79,500$ cubic yards, at 6d.	1,987	10	0
Puddle wall in centre of embankment, 15 feet high, 6 feet thick, and 1,325 yards long. $1,325 \times 2 \times 5 = 13,250$ cubic yards, at 2s.	1,325	0	0
Arming 1,325 yards long of embankment, average measure along face of pavement, 7 yards and 1 yard thick. $1,325 \times 7 \times 1 = 9,275$ cubic yards, at 10s.	4,637	10	0
Parapet, 1,325 lineal yards long, 4 feet high, and two feet thick. $\frac{3,975 \times 4 \times 2}{27} = 1,177$ cubic yards of solid masonry, at 8s.	470	16	0
Cut-work in two tunnels, with sluice-gates, iron-work, &c.	800	0	0
Carried forward	£11726	16	0

* "Before any operations were commenced, Buonaparte personally examined this Polder, and investigated the practicability of recovering it from the sea, and improving it. The chief embankment to shut out the sea was 480 yards long, 15 feet high, 10 feet broad at top, and 30 feet broad at bottom, and cost 40,000 francs; the land of this Polder is let at the rate of nearly three pounds per English acre. The usual rotation of crops are oats, rape, or winter barley; winter barley, pease, beans, or tares.

"The Polder lands require no manure; but after being cropped for upwards of thirty years, they are then laid down in grass. It is considered, in Flanders, that the tillage of the Polder soil might be continued for fifty years without manure, if care be taken to let the grain crops be alternated with those of a leguminous kind."—*I have merely mentioned this circumstance, because a great part of the soil of the Back Strand of Tramore bears a striking similarity in its composition and richness to that of the Polder of Snaerskerke.*

Brought forward	£11726	16	0
Catch-water drain round the Back Strand $\frac{12{,}600\times3\times10\times4}{27}$=56,000 cubic yards, at 3d. - - -	700	0	0
	£12,426	16	0
Contingencies, 10 per cent. - - -	1,242	13	7
Total - - - - - - - -	£13,669	9	7

(*Signed*) WILLIAM BALD,
Dublin, Feb. 1838. *Civil Engineer.*

[In our next number, we will give the sections of the drains and embankments; also the calculations of the discharge of water from each of the catch-water drains, and the different rivers flowing into the bay; as well as other particulars connected with the subject.]

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

Report of Papers read and Proceedings, Session 1838.

(*Continued from page* 200.)

Additional Remarks on the Canal Lifts of the Grand Western Canal, by James Green.

If the trade of the canal were all downward, there would, by the use of these lifts, be carried from the lowest to the highest level of the canal a quantity of water equal to the loads passed down.

Mr. Green stated, in reply to several questions, that in some parts of the canal it had been found impracticable to get a sufficient drain to empty the chamber—they were compelled therefore to use a half lock of eighteen inches' fall; that there were seven lifts and one inclined plane on the canal, effecting a rise of 262 feet in eleven miles. That he should not recommend them as applicable to boats of more than twenty or thirty tons. The width of larger boats was an obstacle. They were extremely advantageous for narrow canals; for boats of fifty or sixty feet in length, and about thirty tons.

Mr. Parkes remarked, that he considered the question of narrow canals as a most important one—the advantage to be derived from narrow canals was a subject to which sufficient attention had not been paid.

The President called attention to the remark in Mr. Green's paper, respecting the quantity of water carried up from one level to another in a downward trade wherever those lifts are used; then a coal country on a high level may supply itself with as much water as it sends down coal. The subject of inclined planes being alluded to, especially those of the Morristown Canal of 200 feet each, where a rise of 1,600 feet is effected by eight inclined planes, Mr. G. remarked that more water and time must be expended, the friction and length being much greater. In the lifts there was only as much water consumed as was equal to the load, but that he should not consider them as practically applicable to more than sixty or seventy feet. Favourable levels with ascents of more than sixty or seventy feet could seldom be found; could he have had the choice of the line in this particular instance, he should have effected by four lifts the rise for which seven are now employed.

Professor Willis, on the Teeth of Wheels.

The geometry of this subject may be considered as complete, but it appears that important additions may be made to its practical applications. The general problem is, having given a tooth of any form, to determine one which shall work correctly with it. The method of effecting this may be shown in a simple practical manner. The curve to be traced out, which is the shape of the required tooth, is the locus of the intersections of all the outlines of the tooth in every one of its positions. The motion produced by the mere contact of the curve so traced out with the given tooth will be uniform. This then is a practical mode of showing the practicability of the problem.

The epicycloids and involutes have hitherto, from the facility with which they can be described, been almost universally employed, and practice has been confined to the class of epicycloids which work correctly with straight lines or circles. The defect under which such wheels labour is, that a wheel of fifty teeth of the same pitch will not work correctly with a wheel of one hundred teeth of the same pitch; since the diameter of the describing circle by which the epicycloid is formed, must be made equal to the radius of the pitch circle of the wheel with which the teeth are to work, and will therefore be twice as large in the second case as in the first. Also, if the teeth be epicycloids, generated by a circle whose radius is equal to that of the wheel with which it is to work, which is equally correct, the same remark applies.

This defect was of no great consequence when the teeth were wooden; but it is of great consequence in iron wheels, since the founder must have a new pattern of a wheel of forty teeth for every combination that it may be required to make of this wheel with others. It is desirable that the teeth of wheels be formed so that any tooth may work correctly with any other of the same pitch. This is the case with involute teeth, but the obliquity of the action is an objection to their introduction. The requisite property may be given to epicycloidal teeth, by employing the following proposition. If there be two pitch circles touching each other, an epicycloidal tooth formed by causing a given describing circle to roll on the exterior circumference of the first, will work correctly with an interior epicycloid formed by causing the same describing circle to roll on the interior circumference of the second.

From this Professor Willis deduces the corollary, that if for a set of wheels of the same pitch, a constant describing circle be taken and employed to trace those portions of the teeth which project beyond each pitch line by rolling on the exterior circumference, and those which lie within it by rolling on its interior circumference, then any two wheels of the set will work correctly together.* This corollary is new, and constitutes the basis of the system already alluded to.

It only remains to settle the diameter of this constant describing circle. The simplest considerations serve to show that the diameter of the constant describing circle must not be greater than the radius of the pitch circle; hence, as a convenient rule, make its diameter equal to the radius of the least pitch circle of the set. This rule is perfectly general, applying to racks and large wheels, as well as to annular or internal wheels. The simplicity of this above the old system is obvious, for on the old every epicycloid requires two circular templets; also there must be as many templets as pitch circles in the set, whereas on this system but one describing templet is required.

For machinery in which the wheels move constantly in the same direction, the strength of the teeth may be nearly doubled for the same quantity of material, by disposing it so that the backs are an involute or the arc of a circle, the acting faces being of the usual form.

In the preceding the exact forms have been described; the author then proceeds to ascertain forms sufficiently accurate for practice, and which are arcs of circles. Euler suggested the substitution of arcs of circles of curvature instead of the curves themselves. The portion of a curve employed in practice is so small that a circular arc is sufficiently accurate, provided the centre and radius with which it is struck be determined by some more accurate method than by mere trial. With this view Professor Willis was led to investigate a method in which the nature and properties of curves proper for teeth are entirely neglected, and a simple construction shown by which a pair of centres may be at once assigned for a given pair of wheels, whence arcs may be struck that will answer the purpose of enabling these wheels to work correctly together.

The nature of the motion produced by the pressure of one circular arc against another, is then examined and reduced to that of a system of three rods, the middle one of which is jointed to two others, moveable at their other extremity about a fixed centre; and a simple construction is arrived at by which we may always find a pair of centres from which two circular arcs may be struck through any point, which will drive each other truly for a small distance on each side of that point. This point, when the side of a tooth consists only of a single arc, should be on the line of centres. It is however more advantageous that the tooth should consist of two arcs, for then there will be two points at which the action is exact—one a little before reaching the line of centres, the other a little after passing it.

From these investigations the author was led to construct an instrument for setting out the teeth of wheels, which may be used with perfect facility by the workmen, and which has been termed an Odontograph; the application of which is fully described. The paper contains many practical observations connected with this subject, tables, &c., and concludes with some directions for ascertaining the correct form of cutters.

On the Ventilation of Tunnels. By W. West.

This paper contains an account of some experiments on the temperature of the air in a tunnel on the Leeds and Selby Railway. There are three shafts in the tunnel; and Mr. West observes, the temperature of the external air being thirty-four degrees, the temperature at the mouth and as far as the first shaft was thirty-four degrees and a half, but that immediately beyond this shaft it rose to thirty-five degrees, and increased uniformly up to the farther end, at which point it was fifty-seven degrees. From this fact the author infers that the air passed up the shaft, and that the tunnel would be more completely ventilated without any shafts; and that shafts generally are an impediment to perfect ventilation.

Wordsdale's Method of Transferring Letter Bags.

The apparatus invented by Mr. Wordsdale for changing the letter bags on the railways without diminishing the speed at which the carriages are travelling, is exceedingly simple. The bag to be taken up is hung on an arm projecting from a post, generally a lamp post; and the bag to be left is suspended at the end of a rod projecting from the back of the railway carriage. The guard knows the exact distance to which the rod is to be pushed out; and the projecting iron of the lamp-post receives the bag to be left at the same instant that a projecting iron on the guard's rod sweeps off the bag to be taken up. This exchange is certain, and effected without any loss of time.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

It affords us much pleasure to be able to lay before our readers the following report, as we heartily agree with every word it contains; especially would we mention, as deserving of high commendation, the part relating to the

* For there is both before and after passing the line of centres an exterior epicycloid working with an interior epicycloid; for before passing the line of centres, the part of the driving tooth *within* the pitch line works only with the portion *without* the pitch line of its follower; and after passing the pitch line, the part of the driving tooth *without* the pitch line works with some portion of the following tooth which is *within* the pitch line.

Council having provided a series of lectures upon various subjects connected with construction. The lectures that have been delivered this session have been of the most valuable description: not only interesting, but of practical service to the profession. We sincerely hope they will be followed up every session with lectures equally valuable.

REPORT OF THE COUNCIL

Presented at the Annual General Meeting held 7th of May, 1838.

When the Council in May last made their Report, it might have been thought that topics of congratulation were exhausted in the enumeration of the successful results attending the formation and subsequent proceedings of this Institute, which had then acquired stability and importance from the Charter of Incorporation granted by his late Majesty William IV. The Queen, however, with that love for Art and Science which has distinguished the very first year of her Majesty's reign, has been pleased to become the patroness of this institute,—at once placing us on a footing with the most distinguished Societies of a similar nature in the empire. This honourable distinction renders it a duty still more incumbent upon the members to promote the objects of the Institute by their personal co-operation, and the contribution of communications. It is by such means only that the body can continue to merit the august patronage which has been so graciously conferred. We must emulate the zeal with which other scientific Societies are pursuing their researches, and like them contribute to the advancement of knowledge, and a more general diffusion of the true principles of taste and science.

The removal of the Institute to apartments at once more convenient, and in a more desirable situation, has been productive of a larger attendance of members and visitors at the ordinary meetings. This circumstance, together with the additions constantly making to the books, models, and casts, prove that the rooms previously occupied would have been totally inadequate to the accommodation now absolutely necessary. The constant accession of new members, and the conviction that the progressive increase of the Library and Collection would outgrow even the present apartments, induced the Council to repeat their application to Government for accommodation in some public building. The Council considered that the present state of the Institute rendered the renewal of the application made in 1835 not inopportune. This application was, as you are aware, again unsuccessful. The Council, however, cannot but consider that the question of such assistance being rendered to public Scientific Bodies acquires strength in the public mind, and that the Government will at length feel itself justified in acceding to the reasonable expectations of those societies, and thus promote, by their countenance and support, the advancement of objects which are not merely of interest to individuals, but highly important to the nation.

The Council have thought it necessary this Session to provide series of lectures, as complete as possible, upon various subjects connected with construction, not only for the purpose of general information, but to show that the Institute is aware of the advantages which must result to Architecture from every department of Science being made to bear upon the main object and purpose for which it is founded. The number of such courses is limited only by the pecuniary means of the Society, but the Council trust that the funds may allow the continuance of the same system of instruction, and that each Session may be distinguished by the delivery of fresh series, as satisfactory as those to which the members have listened with so much pleasure and improvement. There is a wide field still open, and, independently of the history and theory of Architecture as an art of design, there are acoustics, optics, mechanics, and other subjects, forming parts of the necessary practical education of the Architect, which still remain to be considered. It is no less a matter of congratulation that professors of distinguished merit should be induced to consider their respective sciences, not merely in an abstract point of view, but in reference to their useful application to our art, which involves the comfort, the health, and consequently the happiness of every class.

The result of the competitions for the medals offered by the Institute, has this year been most satisfactory, and has led to the institution of an additional medal of merit, in order that the author of one of the unsuccessful designs, which evinced considerable talent, might receive a mark of the approbation of the Members. This medal may be awarded in future also to those drawings and essays which, although distinguished by much merit, have not the first medals adjudged to them. The successful manner in which the subject of the Restoration of a Conventual Building has been treated, has confirmed the Council in their opinion of the propriety of calling the attention of the Architects scattered over the United Kingdom to our national antiquities, confident that the timely investigation of these remains, so deeply interesting to us as Englishmen, will rescue them from that oblivion which might attend the neglect of a few more years. Thus we shall have ere long an important accumulation of authentic documents and information upon the monuments, the taste, the skill, and the customs of our ancestors, valuable not only to the Architect, but to the Antiquarian, the Artist, the Historian, and the Philosopher. We thus at once enrich our collection, and pay a debt of gratitude to those, from the contemplation of whose works we derive so much instruction and delight. At the same time, it is highly important that we should not allow our national predilections to lead us to neglect the classic works of the ancients. It is therefore to be hoped that one of the subjects proposed for the Prizes in each year will continue to be devoted to Greek or Roman Architecture. The investigation of the principles, which guided the masters of antiquity, is essential to the student, and opens sources of the sublime and beautiful, indispensable to him who would distinguish himself in the art. His perception and powers must be necessarily restricted; who can reject, as unworthy his notice, the resources and suggestions which each style offers. The architecture of every period and of every nation has its limits and its peculiar beauties—for although it would appear that there is a point of perfection beyond which the skill of man cannot go, so there is no period in the history of any people in which the taste is so degraded, no country so lost in barbarism, where (if the mental faculties be vigorously exercised) the productions are undeserving attention, and entirely devoid of some characteristic quality.

The report then proceeds to state the number of Fellows and Associates that have been elected since the last annual meeting, and also the reciprocal good feeling that has been kept up between the institute and their brother architects in various parts of Europe. The state of the finances is next exhibited, and the report very properly concludes with the following exhortation :—

Hitherto the Institute has flourished beyond the most sanguine hopes of its founders, but we must not rest satisfied merely with what has been already accomplished. An important sphere of duty attaches to the position which we have been called upon to assume, by the wishes of the profession, by the necessities of the art, and the improving state of those departments of science, the application of which is so important to construction. Its members, therefore, are bound to work out the objects of its foundation, to investigate every branch of art and science connected with architecture, and thus to keep alive the interest now felt in our proceedings. To preserve the continuance of that support which we have already received from the learned, the wealthy, and the noble, we must make this an active and efficient Society, and not rely upon a mere name. Each member must reflect that the Institute is in a degree dependent upon his personal assistance. It is by a combination of individual efforts alone, that any value can attach to its proceedings, and that Architecture in its widest sense can profit by our association. Let every member, therefore, at the end of each Session, put this question to himself—"What have I contributed to the Institute during the past year?" and let him consider whether his answer be commensurate with the position which he holds in society and in the profession, and whether he has fulfilled the pledge given by him in the declaration which he signed upon his admission, "that by every lawful means in his power he will advance the objects of the Institute."

At an Ordinary General Meeting of the Members, held on Monday, the 21st of May, 1838.

H. E. KENDALL, Esq., Fellow, in the Chair.

The following gentlemen were elected. As Associate;—George Edward Laing, Esq., of 5, Charlotte-street, Bloomsbury. As Honorary Member;—J. G. Wilkinson, Esq., author of various works on Egypt. As Honorary and Corresponding Members; Signor Valadier and Signor Camvia of the Academy St. Luke at Rome; Herr Hessmer, Professor of Architecture, Francfort.

Letters were read from the Secretary of the Academy of Fine Arts, at Florence, acknowledging the receipt of the Society's Transactions; and from the Signor Rizio Rangalè at Athens, acknowledging the receipt of the Society's Rules and Regulations; the latter accompanied by copies of the Archeological ephemeris of Athens, three parts. From Signor Rangalè's letter, it appears that the veteran M. Fauvel, the well known French Consul at Athens has paid the debt of nature at Smyrna. This remarkable man left Athens when the Greek revolution broke out, and has since that time constantly resided at Smyrna. His knowledge of antiquity was remarkable, and every traveller who visited Athens, was indebted to his hospitality, and could bear testimony to the amount of valuable information which a long residence in Greece had enabled him to acquire, respecting the antiquities of Greece.

The following donations were announced as having been received since the last Ordinary Meeting. Signor Campanari; Antichi vasi dipinti della collezione Feoli, descritti da Secondiano Campanari. Roma 8vo.—Sir John Drummond Stewart; various original drawings by P. Cortona, J. B. Corneille &c.; through C. Barry, Esq. V.P.—Thomas L. Walker, Esq.; "Examples of Gothic Architecture," part 3rd, folio; by the Donor.—B. Vulliamy, Esq.; an eight day clock, with oak case.—Royal Society; Transactions for the year 1837, parts 1 and 2, and various pamphlets.—Monsieur Blouet, Honorary and Corresponding Member; Rapport sur les Penetenciers des Estats-unis par MM. de Metz et Blouet. Paris, folio.—Henry Rhodes, Fellow; Twenty Pounds for the Travelling fund; print of Grinling Gibbons, and framed drawing of portrait of C. Le Brun.

Resolved that the cordial thanks of the Institute be presented to the Donors above named.

Mr. A. H. Renton continued his papers on iron; the forms of sections and their comparative value.

Mr. Holtzapffel explained the modes of using the scales invented by him.

ARCHITECTURAL SOCIETY.

Ordinary Meetings of the Society, held at their Rooms, 35, *Lincoln's Inn-fields.*

April 10.—The subjects announced for the production of sketches, were as follows. Members;—A design for an entrance to an Arsenal. Students;—A design for a Light-house at the end of a Pier; with a plan.

Mr. George Moore read a very interesting paper, entitled "A Review of the Architecture of the Middle Ages."

May 8.—Mr. François Kreiter, residing at Munich, was elected an Honorary and Corresponding Member.

Subjects for sketches. Members;—A design for a Villa in the Italian style. Students;—A design for a Chimney-piece in a drawing-room of a Nobleman's mansion.

Mr. James Barr read an interesting paper on the "Elementary principles of design in Architecture."

May 22.—Mr. T. L. Walker presented to the Society, a proof copy of the third series of the "Examples of Gothic Architecture."

The report from the Sketching Committee was presented; and the several productions offered by the Student Members in competition for the prizes, were exhibited this evening in the rooms. The prizes are to be awarded on the 1st of June; on which occasion the Society holds its last conversazione for the session.

The essays forwarded in competition for the prizes were this evening read; and in consequence, no further papers were read by the Members.

KING'S COLLEGE, LONDON.

Class of Civil Engineering and Mining.

We perceive with much satisfaction, that the Council of King's College, have followed the example of the Senate of the University of Durham, which in an early number of the Journal we noticed with approbation, by resolving to form a class of Civil Engineering and Mining. We have been obligingly furnished with some particulars of their plan. The course will occupy from two to three years, and will comprise the following important subjects;—Mathematics, Mechanics, Hydrostatics, and Hydrostatical Machines; the Steam Engine and its applications; theoretical and practical Chemistry; Metallurgy, Geology, and Mineralogy; the theory and practice of Mining; the elementary properties of Matter, Sound, Light, Heat, and Electricity; Machine-drawing, practical Perspective, and Surveying. These subjects will be treated, partly by the Professors of the College, partly by masters specially appointed. The courses will begin about the 1st of October, and close about the 1st of July in each year. Students will be admitted at fifteen years of age;—we wish it might be, fourteen; for in most cases, they will not be articled to Engineers till they have passed this course, that is till about eighteen;—and the expense of their education will consequently be much increased. It is intended to hold special examinations in this department, and grant certificates of honour to those who deserve them. And those who have gone through the whole course, obtaining these certificates, will be admitted into the class of "King's College Associates."

We wish the Council full success in their very laudable undertaking; and augur the best results to the rising race of Engineers who may take advantage of the opportunities thus offered to them. From English mechanical ability, cultivated to the utmost by scientific knowledge, and then farther exercised by practical experience, we anticipate advances in the mechanical arts which shall leave the future age no reason to be ashamed, when compared even with the present days of Railways and Steam Navigation.

SOCIETY FOR PROMOTING PRACTICAL DESIGN,

AND DIFFUSING A KNOWLEDGE AND LOVE OF THE ARTS AMONG THE PEOPLE.

St. Martin's Street, Pall Mall East.

The Schools of this Institution are now open; and instruction is at present given to nearly a hundred youths and mechanics. On account of the want of accommodation in the premises which they now occupy, the Society's rooms will be removed in June to Saville House, Leicester Square.

Lectures are delivered every Tuesday and Friday; and include in the present quarter, a course of twelve lectures on the Fine Arts, by B. R. Haydon, Esq. The course includes likewise lectures on Architecture, Pneumatics, and the Steam Engine. In a lecture on Architecture in England, on the 1st of May, Hyde Clarke, Esq. supported the claims of the Gothic to be received as a style of Art, on all the laws of composition; pointing out the artistical skill which was observed in maintaining the strength and unity of the composition, and the knowledge of grouping exhibited in the great works of that style.

MEETING OF SCIENTIFIC SOCIETIES.

Royal Institute of British Architects, Monday evenings, June 4 and 18, at eight o'clock.

Architectural Society, Tuesday evening, June 5, at eight o'clock.

At a late meeting of the Geological Society of Dublin, Mr. Mallett exhibited specimens of Irish minerals, some of them applicable to economic purposes, and explained their uses. The most important were—ochres from Howth and Lambay, fit for making pigments, of which eight specimens were exhibited; Fuller's earth, from Lambay; porcelain clay, from the Sutton side of Howth; sand, for moulding, from Belfast Lough, said to be superior to the English, and quite equal to the Scotch; a mass of conglomerate, cemented by arragonite, from Salthill, Kingstown; and a specimen of sulphuret of nickel from Sheffoy Hill, county of Mayo. It is the first time that this latter mineral has been discovered in Ireland.

PARLIAMENTARY PROCEEDINGS.

House of Commons.—List of Petitions for Private Bills, and progress therein.

Those marked thus — are either withdrawn or rejected.

	Petition presented	Bill read first time.	Bill read second time.	Bill read third time.	Royal Assent.
Aberbrothwick Harbour	Feb. 12.	—	—	—	—
Anti Dry-rot Company	Dec. 7.	Feb. 26.	—	—	—
Ardrossan Railway	Feb. 16.	—	—	—	—
Belfast Waterworks	Dec. 21.	Apr. 6.	..	..	..
Birmingham Equitable Gas	Feb. 16.	Mar. 2.	—	—	—
Birmingham, Bristol, and Thames Junction Railway	Feb. 16.	Mar. 26.	May 15.	..	..
Birmingham and Derby Junction Railway	May 7.	May 25.	..	..	..
Blackburn Gas	Feb. 14.	Mar. 8.	Mar. 22.	May 10.	..
Bolton and Preston Railway	Feb. 15.	Mar. 14.	April 30.	May 23.	..
Boughrood (Wye) Bridge	Feb. 14.	Mar. 26.	April 27.	May 21.	..
Brandling Junction Railway	Jan. 16.	Feb. 14.	Mar. 20.	Apr. 25.	..
Bristol and Exeter Railway	Feb. 12.	Mar. 21.	Apr. 3.	May 9.	..
Bury (Lancaster) Waterworks	Feb. 13.	Mar. 15.	Mar. 30.	May 21.	..
Bude Harbour	Mar. 30.	..	..	..	..
Cheltenham and Great Western Union Railway	Dec. 15.	Feb. 20.	Feb. 27.	Mar. 28.	..
Cookham Bridge	Feb. 15.	Mar. 8.	Mar. 20.	Apr. 25.	..
Deal Pier	Feb. 16.	Mar. 26.	..	May 18.	..
Eastern Counties Railway	Jan. 25.	Feb. 26.	..	..	..
Edinburgh and Glasgow Railway	Jan. 25.	Mar. 2.	Mar. 13.	May 7.	..
Exeter Commercial Gas	Feb. 16.	Mar. 26.	April 27.	May 21.	..
Farringdon (London) Street	Feb. 5.	Mar. 26.	..	..	..
Fen Drayton (Cambridge) Enclosure	Feb. 11.	—	—	—	—
Fishguard Harbour	Feb. 9.	Feb. 23.	Mar. 12.	May 8.	..
Fleetwood Tontine	Feb. 15.	Mar. 26.	..	..	..
Garnkirk and Glasgow Railway	Feb. 13.	Mar. 26.	Apr. 25.	..	..
Glasgow Waterworks	Feb. 2.	Feb. 26.	Mar. 16.	..	..
Grand Junction Railway	Feb. 12.	Mar. 8.	Mar. 29.	..	..
Gravesend Cemetery	Feb. 14.	Mar. 21.	Apr. 8.	April 30.	..
Gravesend (No. 1) Pier	Jan. 25.	Feb. 7.	Feb. 26.	..	..
Gravesend (No. 2) Pier	Feb. 16.	Mar. 26.	..	..	..
Great Central Irish Railway	Feb. 26.	Apr. 3.	..	..	..
Hartlepool Dock and Railway	Feb. 16.	Mar. 26.	May 3.	..	..
Herne Gas	Feb. 16.	Mar. 26.	..	..	..
Isle of Thanet Cemetery	Feb. 14.	Mar. 26.	..	..	..
Lady Kirk and Norham (Tweed) Bridge	Feb. 16.	Mar. 26.	..	..	..
Leamington Priors Gas	Feb. 16.	Mar. 26.	April 26.	..	..
Leicester Gas	Feb. 16.	Mar. 26.	April 30.	..	..
London and Croydon (No. 1) Railway	Dec. 22.	Feb. 23.	Mar. 7.	April 4.	..
London and Croydon (No. 2) Railway	Dec. 22.	—	—	—	—
London and Greenwich Railway	Dec. 11.	Feb. 7.	Feb. 20.	Mar. 21.	Apr. 11.
London Grand Junction Railway	Feb. 15.	Mar. 26.	April 26.	—	—
Londonderry Bridge	Nov. 27.	Mar. 5.	April 30.	..	..
Manchester, Bolton, and Bury Canal, &c.	Jan. 23.	Feb. 19.	Mar. 8.	May 3.	..
Metropolitan Suspension Bridge	Feb. 16.	Mar. 26.	May 8.	..	..
Midland Counties (Mountsorrel) Railway	Feb. 8.	Mar. 16.	Mar. 29.	May 23.	..
Montgomeryshire Western Branch Canal	Jan. 16.	Feb. 27.	—	—	—
Moy River (Ireland) Navigation	Feb. 13.	—	—	—	—
Necropolis Cemetery	Dec. 14.	Feb. 12.	Feb. 26.	..	..
Newcastle-upon-Tyne Railway	Dec. 4.	Feb. 9.	Mar. 6.	May 3.	..
Newcastle-upon-Tyne and North Shields Railway	Feb. 11.	—	—	—	—
Newquay (Cornwall) Harbour	Feb. 13.	Mar. 26.	May 3.	May 28.	..
Newtyle and Cupar Angus Railway	Feb. 13.	Mar. 26.	April 25.	..	..
Oldham Gas and Waterworks	Feb. 13.	Mar. 8.	April 2.	..	..
Oxford and Great Western Union Railway	Feb. 16.	Mar. 7.	Mar. 14.	..	..
Paington Harbour	Dec. 7.	Dec. 22.	Jan. 16	Feb. 28.	Mar. 30.
Portland Cemetery	Feb. 16.	—	—	—	—
Portsmouth Floating Bridge	Feb. 15.	Mar. 8.	Mar. 26.	April 27.	..
Rocester Bridge	Feb. 14.	Mar. 19.	April 3.	May 21.	..
Royal Exchange	May 25.	..	..	..	..
St. Helen's and Runcorn Gap Railway	Feb. 15.	Mar. 16.	Mar. 30.	April 27.	..
St. Philip (Bristol) Bridge	Feb. 16.	Mar. 26.	May 10.	..	..
Saltash Floating Bridge	Dec. 21.	—	—	—	—
Soane's Museum	Feb. 12.	—	—	—	—
Southampton Docks	Feb. 14.	Mar. 29.	May 7.	..	..
Southampton Pier	Feb. 9.	Mar. 26.	May 4.	..	..
Taw Vale (Devon) Railway and Dock	Feb. 15.	Mar. 12.	Mar. 26.	May 8.	..
Tenby Improvement and Harbour	Jan. 23.	Feb. 9.	Feb. 26.	Apr. 3.	..
Thames Improvement Company and Drainage Manure Association	Dec. 4.	Feb. 16.	..	..	..
Thames Purifying Company	Feb. 16.	—	—	—	—
Turton and Entwisle Reservoir	Feb. 13.	Mar. 8.	Mar. 21.	May 8.	..
Tyne Dock	Feb. 16.	—	—	—	—
West Durham Railway	Feb. 16.	—	—	—	—
West India Docks	Feb. 13.	Mar. 23.	Apr. 9.	April 30.	..

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 28TH APRIL, AND THE 24TH MAY, 1838.

John Paterson Reid, Power-Loom Manufacturer; and Thomas Johnson, Mechanic, for "Certain Improvements in preparing Yarn or Thread, by Machinery suitably for Warps in preparation for Weaving in Looms."—28th April; 6 months.

Joseph Jepson Oddy Taylor, of Gracechurch Street, in the City of London, Machinist, for "An Improved Mode of Propelling Ships and other Vessels on Water."—1st May; 6 months.

Miles Berry, of Chancery Lane, in the County of Middlesex, Patent Agent, for "A New and Improved Method or Process of Alloying Metals by Cementation, particularly applicable to the Preservation of Copper, Wrought or Cast Iron, and other Metals, and thereby operating a change in the appearance of their Surface, and giving them more brilliancy. Communicated by a Foreigner residing abroad."—3rd May; 6 months.

John Ball, of Finsbury Circus, in the County of Middlesex, Merchant, for "Improvements in Carriages. Communicated by a Foreigner residing abroad."—3rd May; 6 months.

Edward Cobbold, of Long Melford, in the County of Somerset, Clerk, Master of Arts, for "Certain Improvements in the Manufacturing of Gas for affording Light and Heat, and in the Application of certain Products thereof to useful Purposes."—5th May; 6 months.

Edmund Shaw, of Fenchurch Street, in the City of London, Stationer, for "Improvements in the Manufacture of Paper and Paper Boards. Communicated by a Foreigner residing abroad."—5th May; 6 months.

Thomas Joyce, of Camberwell New Road, in the County of Surrey, Gardener, for "Certain Improved Modes of applying Prepared Fuel to the purposes of Generating Steam and Evaporating Fluids."—5th May; 6 months.

Pierre Armand Lecomte de Fontainemoreau, of Charles Street, City Road, in the County of Middlesex, for "An Improved Method of preventing the Oxydation of Metals. Communicated by a Foreigner residing abroad."—5th May; 6 months.

William Gossage, of Stoke Prior, in the County of Worcester, Manufacturing Chemist, for "Certain Improvements in Manufacturing Sulphuric Acid."—8th May; 6 months.

William Henry James, late of Birmingham, and now of London, Civil Engineer, for "Certain Improvements in Machines or Apparatus for Weighing Substances or Fluids, and for certain Additions thereto applicable to other Purposes."—8th May; 6 months.

William Crofts, of Radford, in the County of Nottingham, Machine Maker, for "Improvements in the Manufacture of Lace."—10th May; 6 months.

Miles Berry, of Chancery Lane, in the County of Middlesex, Patent Agent, for "A New or Improved Method of Applying certain Textile and Exotic Plants, or Substitutes in various Cases for Flax, Hemp, Cotton, and Silk. Communicated by a Foreigner residing abroad."—14th May; 6 months.

Jean François Isidore Caplin, of Portland Street, in the County of Middlesex, Artist, for "Improvements in Stays or Corsets, and other Parts of the Dress where Lacing is employed, and in Instruments for Measuring for Corsets or Stays, and for the Bodies of Dresses. Communicated by a Foreigner residing abroad."—14th May; 6 months.

Alexander Happey, of Basing Lane, in the City of London, Gentleman, for "A New and Improved Method of Extracting Tar and Bitumen, from all Matters which contain those Substances, or either of them. Communicated by a Foreigner residing abroad."—14th May; 6 months.

Thomas Mellodew, of Wallshaw Cottage, near Oldham, in the County of Lancaster, Mechanic, for "Certain Improvements in Looms for Weaving various Kinds of Cloth."—15th May; 6 months.

James Vincent Desgrand, of Size Lane, in the City of London, Merchant, for "A certain New Pulpy Product or Material, to be used in Manufacturing Paper and Pasteboard, Prepared from certain Substances not hitherto used for such Purposes. Communicated by a Foreigner residing abroad."—15th May; 6 months.

Francis Hope, of Knaresborough, in the County of York, Flax spinner, for "Certain Improvements in Machinery, or Apparatus for Heckling, Preparing, or Dressing Hemp, Flax, and other such like Fibrous Materials.—15th May; 6 months.

David Stead, of Great Winchester Street, in the City of London, Merchant, for "Making or Paving Public Streets and Highways, and Public and Private Roads, Courts, and Bridges with Timber, or Wooden Blocks. Communicated by a Foreigner residing abroad."—19th May; 4 months.

Samuel Seaward, of the Canal Iron Works, in the Parish of All Saints, Poplar, in the County of Middlesex, for "Certain Improvements in Steam Engines."—21st May; 6 months.

Augustus Applegath, of Crayford, in the County of Kent, Calico Printer, for "Improvements in Apparatus for Block Printing."—22nd May; 6 months.

Henry Adcock, of Liverpool, in the County of Lancaster, for "Improvements in Raising Water from Mines and other Deep Places, or from a Lower Level to a Higher; which Improvements are Applicable to Raising Liquids Generally, and to other Purposes."—22nd May; 6 months.

John Ratcliff, of Birmingham, in the County of Warwick, Lamp Manufacturer, for "Improvements in Lamps."—22nd May; 6 months.

Robert Martineau, of Birmingham; and Brook Smith, of the same place, Cock Founders, for "Improvements for Cocks, for Drawing off Liquids."—24th May; 6 months.

John Radcliffe, of Stockport, in the County of Chester, Machine Agent, for "A New Method of Removing the Fly, Droppings, Waste, and other Matters; which, being separated from the Material, falls below the Cylinders and beaters in the respective processes of Carding, Willowing, Devilling, Batting, Blowing, Scutching, Opening or Mixing of Cotton-Wool, Silk, Flax-Wool, or any other Fibrous Material or Substance."—24th May; 6 months.

Charles Searle, of Fitzroy Street, London, in the County of Middlesex, for "A New Description of Ærated Water or Waters, and which Method of Ærating is Applicable also to other Fluids."—24th May; 6 months.

STEAM NAVIGATION.

The "Sirius" and "Great Western" Steam ships.—Great has been the interest excited during the past month respecting the progress of the grand experiment which these vessels have been trying. And now that they have both returned, in safety and with honour, we think we cannot do better than give a brief summary of the scraps of news respecting them, which we have amused ourselves by collecting. Every vessel arriving from America, was eagerly questioned whether she had met the adventurers in whose fate the world was interested. The Sirius was the first heard of; and from her position as reported by one vessel after another, her rate of sailing was calculated. The Sirius had been repeatedly spoken with, before any tidings had been heard of the Great Western; and one paragraphist at least, ventured to express "much anxiety" respecting her. But the Atlantic is a tolerably large extent of water even for the Great Western to sail upon; and her proprietors, strong in faith, did not think fit to discontinue their advertisements that she would "leave Bristol for New York, on or about the 26th inst." And the Sirius in like manner was advertised as "intended to leave London on the 23rd inst., and Cork on the 28th inst.". The Great Western was discovered at last; and as if to make up for lost time, spoke with four ships in two days. And now was the time for calculation; it was found that the Sirius had not retained the start she had set off with; and bets were eagerly laid, especially at Bristol it is said, that the Great Western would reach New York the first. If any, like ourselves, have laid down upon the map the various situations given for the two vessels on successive days, comparing the different accounts, they may like us have met with interesting results. We did hear indeed of one journalist who took the liberty to place one of the ships one day in the centre of some continent or other, not generally supposed to lie in the way to New York;—perhaps she went for fuel. For ourselves, we have met with no such decided vagaries, and are inclined to think that neither of the vessels *bolted* in the race. The result of the outward voyages is as follows: the Sirius sailed April 4, arrived April 22 evening, was out 17 clear days from Cork; the Great Western sailed April 7, arrived April 23 morning, was out 15 clear days from Bristol. Their arrival appears to have created even a stronger sensation in New York, than their departure in England;—and not unnaturally,—the winning post is always a place of keener interest than the starting post; in this case also there were two starting posts, but only one goal. Of the homeward voyage, each ship of course brought her own first account; they might tell of sailing vessels passed and likely to arrive, but must be their own heralds to their native shore. The Sirius sailed May 1st, afternoon, arrived at Falmouth May 18th evening, was out 16 clear days. The Great Western sailed May 7th, arrived at Bristol May 22nd, was out 14 clear days. The Sirius returned to the Thames on Monday night the 21st ult., and was expected to leave for Cork on Saturday, and to sail thence on Wednesday the 30th; thus exceeding her advertised time but two days. Nor need the Great Western probably delay much beyond the advertised time for her second trip. On the whole, we consider the experiment triumphantly successful; and doubt not speedily to have to report an average time for the trans-Atlantic voyage. It will be seen, that the Great Western has the advantage of her rival in point of speed; as indeed was to be expected from her having been built expressly for this station. We do not expect again to report of her as we did last month, that several of her intended passengers forfeited their fare through fear of sharing in the risks of the experiment she was about to try. The experience of her homeward voyage was very different; she brought 68 cabin passengers, the greatest number it is said, that ever crossed the Atlantic in one ship. She will speedily have to cope with rivals, like herself built for Atlantic navigation;—nor need she fear; she has proved herself excellent, and if others surpass her, she will still retain her early honours, and keep up a reputation high at any rate, if not the highest.

The "British Queen."—This magnificent steam ship was launched, or, more properly speaking, floated out of dock, on Thursday, 24th ult. She is the property of the British and American Steam Navigation Company, and has been built by Messrs. Curling and Young, at their ship-yard in Limehouse: the engineering contract is being executed by Messrs. Napier and Co. She is destined to carry cargo and passengers between London and New York. Her launch from the stocks was found to be impracticable in consequence of the size of the dock and the depth of the water in front; she was therefore necessarily floated out.

Precisely at two o'clock, it being at that time high water, the signal was given, the stupendous vessel took leave of her moorings, and as she majestically ploughed her way into the river, amidst the rejoicings of the multitude, the Honourable Mrs. Dawson Damer, who occupied a conspicuous position upon a platform erected for the purpose, was seen to hurl at her the baptismal offering, and christen her the "British Queen." When she reached the river, being surrounded by vessels of the ordinary size, her huge proportions became even more apparent than they were before. Having floated a short distance up the river with the tide, she was taken in tow by the Fame steamer, and finally cast anchor outside a tier about a quarter of a mile below Messrs. Curling and Young's yard, where she lay till the next day, when she was taken into the East India Docks.

The period of her embarkation is not yet fixed; but the expectation is, that it will be about October or November next. She has not at present any of her internal fittings or decorations, but they will be proceeded with immediately.

Her state cabin or saloon is a noble apartment. What, we believe, is called her figure-head, is a graceful full-length of the Queen, with the sceptre in her right hand and the orb in her left. The likeness of her Majesty is excellent. The vessel's present draught of water is only ten feet; and when her engines are in and she is thoroughly equipped, her draught will be sixteen feet. The number of passengers for whom accommodation is to be provided is in the whole 280.

DIMENSIONS OF THE VESSEL AND ENGINES.

Length, extreme, from figure-head to taffrail	275	feet.
Length on upper deck	245	„
Length of keel	223	„
Breadth of beam	40½	„
Breadth, including paddle-boxes	64	„
Depth	27	„
Tonnage	1,862	tons.
Power of her two engines	500	horse.
Diameter of cylinders	77½	inches.
Length of stroke	7	feet.
Diameter of paddle wheels	30	„

Estimated weight of engines, boilers, and water -	500	tons.
Ditto of coals for 20 days' consumption - -	600	„
Ditto of cargo - - - - -	500	„
Draught of water with the above weight and stores -	18	feet.

The British Queen is believed to be the largest ship in the world, the length exceeding by about thirty-five feet, any ship in the British navy.

The New Quicksilver Steam ship "Columbus."—This splendid new steamer, destined shortly to cross the Atlantic, which has created much interest, from the novel construction of its machinery, on April 24th took a trial trip down the Mersey and round the light-ship, with a highly-respectable party of gentlemen on board. She excited much curiosity on the river, from the novelty of her appearance and the beauty of her model. The Columbus is 330 tons, builders' measurement, being 21½ feet beam, and 145 feet keel, with 18½ feet depth of hold. She has 2 engines equal to 110 horse power; the cylinders are 40½ inches diameter and 3½ feet stroke, and the wheels 17½ feet diameter. Her speed through the water is ten statute miles per hour; her immersed section at her present load is 150 square feet. She has now on board twenty days' fuel, besides 30 tons of iron ballast. The novelty of the engines (Mr. Howard's patent) consists in a new method of producing the steam, and of condensing it, the latter part of the invention being applicable to the ordinary boilers. In a boiler the heat from the fuel is passed over very extensive surfaces, in contact with which is a large body of water, the temperature of which is always such as is due to the density or pressure of the steam, and consequently the evaporation is limited by such circumstances. In this invention the steam is formed by bringing a small quantity of water previously made boiling hot, in contact with a comparatively small surface, heated to, and *maintained at* the temperature of most rapid vaporization, viz. about 400 deg., to effect which a quantity of mercury or amalgam lies between iron plates, the one near the fire being a plain surface of only three quarters of a foot per horse power, and the other, or vaporizing surface, being about four times as much. The steam never obtains a density or pressure due to the temperature, but is itself heated to about 400 deg., and worked at about ten pounds to the inch, and cut off from the cylinder at half the stroke. The condensation is effected by the repeated *injection* of the *same* water. This principle of condensation is effected as follows, on board the Columbus:—the air pumps withdraw the warm injection water from the condensers into the hot cisterns, from which it passes slowly through a series of copper pipes exposed to the action of the external cold sea water in a cistern supplied by a pump, on the air pump cross-head, and then is re-injected amidst the steam in the condensers, after having been effectually cooled by its transmission through the pipes. This process of condensation is obviously equally applicable to the ordinary engines with boilers, and is most effectual. The fuel made use of is coke or stone-coal, or fuel giving a strong local heat and little flame; that employed on Tuesday was Kilkenny coal. The consumption of fuel is three tons per day of 24 hours, and the fire grates have a total bar surface of only 22 feet, the air being supplied by a small blowing machine, under easy regulation. The iron plates exposed to the fire are perfectly secured from any bad effect from the somewhat intense heat, by the close contact of the mercury within them, which absorbs and gives out the heat with the utmost rapidity. The combined effect of the reduction in the consumption of fuel, and the weight and size of the vaporizers, compared with boilers, is such that a steam vessel of any ordinary tonnage and power will be enabled at her loaded immersion to make a voyage of *five times* the length now practicable.—*(Abridged from the Liverpool Standard.)*

India Steam Navigation Company.—We understand that Sir John Ross, R.N., the Chairman, and Mr. C. Manby, the Engineer of the Company, have been to Liverpool to endeavour to negociate for the purchase of a steam ship suitable for their service, but that they were unsuccessful. We do not think it likely that they will meet with one that will suit their purpose, and they had much better go to work boldly, and give directions for the building of a vessel and the construction of engines immediately. The successful trips of the Sirius and the Great Western across the Atlantic have mainly set the question at rest as to the practicability of a voyage by the Cape to India.

New Iron Steam Packet.—On Wednesday, the 9th ult., the launch of another iron steam boat from the manufactory of Messrs. Fairbairne and Co., Millwall Works, Poplar, took place. Notwithstanding the rapid advance which this description of vessels has of late years made in public estimation, the port of London has been, if we may so term it, second in the race,—comparatively few having been launched upon the Thames. This may in some degree account for the interest which the launch excited. The ceremony of naming the vessel, which has been called the Nevka, was performed by Miss Fairbairne; and at half-past one, the last of the shores having been knocked away, the boat glided gently and gracefully into the water, amidst the waving of flags and the hearty cheers of the thousands of spectators who lined the shores or were stationed in boats around. The Nevka has been built for the Emperor of Russia's private use, and measures 148 feet in length, by 18 feet in beam. She is of nearly a similar model with the Sirius, launched from this factory a short time since, and combines great stowage-room, in proportion to her bulk, with a strength and buoyancy hitherto unattainable in boats built with timber. Her draught of water when afloat was only two feet three inches, and with her boilers and all her *materiel* aboard she will draw little more than three feet. The builders have received *carte blanche* for the fittings up and decorations, which will be of the most costly and elegant description.

Steam Communication with Yarmouth.—A splendid new steam-packet, named the Circassian, Mr. James Hardie, commander, has recently commenced running between London and Yarmouth. She is the property of the Clyde Steam Navigation Company, and was built by Mr. Charles Wood, at Dumbarton. As a specimen of nautical architecture, she is in strict keeping with other productions from the romantic and far-famed banks of the Clyde. She is 400 tons burthen, propelled by engines of 150 horse power, and is said to be capable of accomplishing the passage between London and Yarmouth in twelve hours.

Poole, May 4.—On Thursday last, the Commercial Steam Company's steamer Cornubia arrived here. On Thursday a public meeting of the inhabitants was held at the Guildhall, for the purpose of taking into consideration a proposal from the Commercial Steam Packet Company, for placing a steamer between Poole, the Isle of Wight, Southampton, Portsmouth, and London. Mr. G. Penney being called to the chair, several resolutions were unanimously entered into for carrying the same into effect, the company offering to establish a packet here, on the inhabitants taking 400 shares of 5*l.* each, which no doubt will soon be done. The Cornubia will start for Southampton on Monday next.

Quick Sailing.—A new steam-ship, of 560 tons, built by Mr. George Mills, Bowling Bay, started from Greenock on Friday night, April 27, at 12 o'clock, for London (by the South of England), and arrived at 12 o'clock forenoon, on the following Tuesday, having performed the passage in the short space of three days and twelve hours, including four hours stoppage for a pilot at Dungeness.—*Glasgow Herald.*

PROGRESS OF RAILWAYS.

London and Birmingham and Grand Junction Railways.—We have heard with much pleasure that there is no longer any foundation for the opinion, that any misunderstanding exists between the directors of these two companies. On the contrary, we are assured that the mode to be adopted at Birmingham, when the lines are each finished there, for the transfer of the passengers and their luggage from the one line to the other, has been satisfactorily arranged; but that until the permanent station of the Grand Junction Company, contiguous to that of the London and Birmingham Company in Curzon-street, has been completed, the inconvenience of going from one station to the other, in omnibuses, as at present, is unavoidable. We understand also, that the directors of the London and Birmingham line are at present much restricted in their power of changing the hours of departure and arrival of their trains, on account of engineering operations still in progress on those parts of the line which have been recently opened; and from some difficulties connected with the horsing of the coaches on the road, between Denbigh Hall and Rugby, a work in which, we believe, no fewer than 700 horses are already engaged. It is their intention, however, as soon as these difficulties are removed, to curtail any unnecessary detention in Birmingham; and it is proper to add, that as the directors of this company have made all their arrangements with a view of insuring the most perfect punctuality in the arrival of the trains, as well at the intermediate stations, as at the two termini, the most prompt measures have been taken to remove every cause of detention, which the first few days of working the line brought to light; and it may reasonably be expected, that in a very short time the travelling upon it will be attended with as few inconveniences as are compatible with a partial opening. We believe we may add, that it is intended to set on one or two additional trains immediately, with an especial reference to the convenience of travellers from Manchester and Liverpool.—*Manchester Guardian.*

Gloucester and Birmingham Railway.—The contractors of the Balsall Heath line of road are staking out the ground, and have commenced removing the soil from the hill on the side of Moseley, for the purpose of embankment towards Camphill; which will in some places be about nine yards above the present elevation of the land. An inquisition was held on April 28th, at the Orange-tree Tavern, Highgate, Birmingham, for the purpose of ascertaining the amount to be paid by this company to James Taylor, Esq., of Moseley, as a compensation for his interest in some gardens, called the "Guinea Gardens," lying about a mile from Birmingham. The quantity of land required, was 2a. 3r. 15p., for which 1,278*l.* 6s. 8d. was asked by Mr. Taylor; 600*l.* was offered by the company, and 910*l.* adjudged by the jury.—*Gloucestershire Chronicle.*

Hull and Selby Railway.—Upwards of 25,000*l.* has been received out of 40,000*l.*, the amount of the third call of 5*l.* per share, due on the 16th ult. A great number of men are employed on various portions of the line; and Mr. Walker, the chief engineer, who was in Hull last week, and went over the works, has expressed his satisfaction with the manner in which they have been thus far executed, and with the progress made.—*Hull Observer.*

Eastern Counties Railway.—The works of this railway, between Mile-end and Romford, are now prosecuting with great activity. The temporary terminus will be at a large open space on the right side of Dog-row, within less than a furlong of Mile-end turnpike, the great eastern outlet of the metropolis. The embankments which are to connect the bridges and culverts over the numerous tide-streams that intersect the Stratford marshes, are under contract to be finished before the middle of May. The stuff for the purpose (gravel of the finest quality) is supplied from a cutting from 8 to 14 feet deep, which commences close to Angel lane, at the back of Stratford, and is continued by Maryland Point, Forest Gate, and Holmfirth House, to the valleys of the Aldersbrook and Roding. The bridge over the Aldersbrook is done, all but the parapets; and that over the Roding is up to the springing of the arches. Between these two bridges there is an embankment about 20 feet high, more than two-thirds of which are completed. Another short embankment of about 18 feet high, which is also nearly finished, carries the railway from the Roding bridge to a level at the entrance of the town of Ilford, immediately behind the Red Lion Inn. Here there will be a station, and a broad entrance from the turnpike road. Before the railway leaves Ilford, it descends again into a cutting, which extends in a north-easterly direction to the valley of the Rom, passing under the turnpike road at the eight-mile stone. At this point a very considerable deviation from the turnpike road has been found requisite, and has been executed. In a few days it will be in a state of consolidation fit for the reception of the traffic of the road; and then the bridge, which is to carry the old road over the railway will be begun. The officers of the company still speak with confidence of being able to open to Ilford in July or August.—*Railway Times.*

Sheffield, Ashton-under-Lyne, and Manchester Railway.—The meeting of directors, at Penistone, on April 18th, was the most important which has been held since the passing of the act. Mr. Vignoles received his final instructions to commence immediately, on various parts of the line, so as to stake out and accurately determine the land required to be purchased, by the end of this year, or the beginning of next; also to complete the drawing of plans, sections, &c., preparatory to letting the contracts.—*Sheffield Independent.*

Glasgow and Ayrshire Railway.—We are glad to observe that this undertaking is now on the eve of being commenced—contractors being invited to come forward to execute the works extending from Ayr to Irvine. The operations at the other extremity are also in progress; and we understand that the contracts are concluded for the portion between Irvine and Kilwinning, including two spacious bridges over the Irvine and Garnock rivers.—*Glasgow Chronicle.*

Glasgow, Paisley, Kilmarnock, and Ayr Railway.—We understand, that the works on the portion of the Railway in Ayrshire have been commenced, and that the foundation-stones have been laid of the important bridges over the Garnock and Irvine waters. Tenders have likewise been received for forming the line between Irvine and Ayr; and these, as well the contracts between Irvine and Dalry, are at a rate below the engineering estimates. The line from Dalry to Ayr is expected to be

opened at the end of next summer, and that between Glasgow and Johnstone a few months later.—*Glasgow Courier.*

Bristol and Exeter Railway.—The works in this line are proceeding most vigorously, and we perceive that three further contracts are advertised, extending from Lympsham to Bridgwater, a distance of about twelve miles, and completing the thirty-three miles which are to be opened in the course of next year. This line, though of less than half the cost per mile, owing to its naturally easy levels, is being constructed on the same principles as the "Great Western."

Commercial Blackwall Railway.—This company is purchasing the property on the line as fast as it can; and the instant possession shall have been obtained, operations will be commenced.

Railway from Northampton to the London and Birmingham Line.—This branch Railway is in contemplation, and a survey has just been completed by an engineer, whose report is very favourable.

Taff Vale Railway.—This Railway is progressing very favourably. Satisfactory arrangements have been made with nearly the whole of the proprietors whose lands will be wanted, and along the whole line the utmost activity is now perceptible. The portion comprised in the Cardiff district was commenced last week, and already conveys an idea of its formation when ready. It is avowed by those most competent to give an opinion, that in less than eighteen months the Railway will be opened as far as Quaker's Yard from Cardiff. The Bute Ship Canal will also be completed about the same time; and, these two stupendous undertakings combined, must soon contribute to place Cardiff much higher in the scale of maritime towns than it stands at present.—*Cambrian.*

North Union Railway.—The contractors for this line have availed themselves of the late favourable weather for carrying forward the operations, now fast progressing towards completion. The bridge across the Ribble will be the only impediment to finishing the undertaking by August, as originally contracted for. At the Wigan end, the embankment has already been extended to a considerable distance over the iron bridge in Wallgate, in that town; and, if the weather continue fine, and the same number of men constantly employed as there has been for a considerable time back, a very short period will elapse ere the North Union Railway will be joined to the line which leads from Parkside to Wigan.

Cheltenham and Great Western Union Railway.—From the half-yearly report of this company, presented on the 4th ult., we make the following extract:—"The directors have great satisfaction in being enabled to report that the bill introduced in the present session of parliament has been read a second time in the House of Lords—that the evidence on it has been taken in the committee, and that it only waits the arrangement of some new clauses, which the Lords require to be introduced into all future railway bills, prior to the third reading. This bill is one of very great importance to the company. It empowers them to make the deviation applied for, in the tunnel at Sapperton, which will considerably diminish its length and expense, and will obviate the objection formerly so much urged against it, that it was curved, by rendering it straight. In order to effect this, however, that portion of the line must be commenced without delay, and the works must be carried on simultaneously with that portion of the railway lying between Cirencester and Swindon. This necessarily deranges, to some extent, the plan of operations resolved on at the last general meeting; but as there can be no doubt of a profitable return for the outlay, and as it is of the greatest consequence to this company to retain all their existing rights, without the interference of another company on any portion of their line, the directors have no hesitation in recommending that all necessary measures be immediately adopted to secure the construction of the line from Cheltenham to Gloucester, by the time appointed. The directors are enabled to state, from authority, that the Great Western Railway will be opened to Maidenhead early in June. They are gratified in being enabled to state that public confidence in the superiority of the mode of construction of that railway, adopted by Mr. Brunel, over that of the lines now in use, is daily increasing; that they feel convinced the result will be eminently successful, and that they entertain no doubt but the opening of that line will have a very beneficial influence on the interests of this company, so intimately connected with it."

Midland Counties Railway.—This company offered Mr. Needham 1,500*l.* for the land required by them, a few hours before the inquiry took place. Mr. N. claimed 2,800*l.* 10s. The jury awarded him 1,260*l.*—loss by going to a jury, 240*l.*

Northern and Eastern Railway.—On Tuesday, the 15th ult., a special general meeting of the shareholders of this company took place at the City of London Tavern, Bishopsgate-street, H. G. Ward, Esq., M.P., in the Chair,—to deliberate upon a plan now in contemplation, to effect a junction between the Northern and Eastern, and Blackwall Commercial Railways, by means of a branch line passing from Tottenham Mills on the Northern and Eastern, to the terminus of the other line at Blackwall. The terminus of the Northern and Eastern line, as originally proposed, was Islington; and one of the advantages that would result from the adoption of the junction line, would be the getting rid of an immense outlay in constructing the portion of the railway from Tottenham Mills to Islington, which is the most difficult and costly part of the undertaking, and the only part where tunnelling is required. The chairman having explained the object for which the meeting had been convened, reports were read from the directors of the company, and from Messrs. George Stephenson and George Bidder, the engineers of the Blackwall Railway, detailing the advantages which would result from the project; such as securing a direct communication with the river, and with the heart of the city. The plan proposed for carrying the junction line into effect was stated to be by means of a new company, consisting of the shareholders of the existing companies and others, and it was thought that an act of incorporation could be obtained next session. The total cost of the junction line would be about 120,000*l.* Several gentlemen addressed the meeting, and expatiated on the advantages that would result from the scheme. Mr. Routh, chairman of the Blackwall Company, expressed his cordial concurrence, and that of his co-directors, in the plan. Resolutions, authorising the directors to carry the scheme into effect, subject to the confirmation of a subsequent meeting, were carried unanimously.

Caledonian, Furness, and West Cumberland Railway.—It is not generally known that Mr. Hague, now engaged in the survey of this line, is the inventor of the patent pneumatic machinery, by which the transfer of power may be accomplished with little friction for many miles; and the powerful streams of water in the north, rendered available, to the extension of its manufactures and the increase of its mining produce.

London and Birmingham Railway.—On Thursday the 24th ult., the workmen completed the removal of the immense scaffolding, fronting the stone entrance to the London station at Euston Grove. During the week the elegant iron gates will be affixed, and the wooden palings removed. The whole, when completed, will present an elegant appearance from Euston Square and the New Road.

Birkenhead Railway.—There is now an immediate prospect of the Chester and Birkenhead railway being commenced. The contractors have broken ground, and the company's agent has certified before John Dean Clare, Esq., a county Magistrate, that the whole of the money is subscribed. The Sheriff summoned a jury, to meet at Birkenhead, on Thursday last, to assess the value to be paid for the land to be taken from those gentlemen who art not satisfied with the valuation put on it by the company's surveyor.

Newcastle and Carlisle Railway.—On Wednesday the 3rd ult., a meeting of the directors was held at Haltwhistle, when it was determined to open the whole line (should no unforeseen event prevent it) on the 18th of June, the anniversary of the Battle of Waterloo.

Opening of the London and Southampton Railway.—On Tuesday, the 1st ult., the directors of this railway proceeded along the line from London to Woking-common, a distance of 23 miles, preparatory to its being opened to the public on the 14th. The object of the journey was to arrange the stations, as well as to test the safety of the line, and to give such orders as should insure the public against accidents on the opening. The excursion was most satisfactory. The engine employed on the occasion was made by Messrs. C. Tayleur and Co., of Warrington, and during some parts of the journey, went at the rate of 25 miles an hour. It was a singular and gratifying circumstance that the directors were on this occasion accompanied by John Moss, Esq., the chairman of the directors of the Grand Junction Railway, and by Charles Lawrence, Esq., the chairman of the directors of the Liverpool and Manchester Railway; and these gentlemen both expressed themselves highly pleased with the state of the works, and comparatively finished state of the railway. On Saturday, the 12th ult., the directors, accompanied by a few personal friends, by the engineer, and many persons of distinction, set out from the terminus at Nine Elms, shortly before two o'clock, and accomplished the twenty-three miles and a half with perfect ease in forty-five minutes. Having partaken of a liberal luncheon, which had been provided for the occasion, the party again entered the carriages, and returned to town even with greater rapidity than they left it, for the distance home was accomplished in forty-three minutes. Nothing can exceed the ease and luxury of this mode of travelling—the carriages, elegant in outward appearance, are perfect models of comfort within—there is not a jar or shake of any kind to disturb even the most delicate nerves—the pace is as smooth as it is rapid. It is needless to observe, that the country through which the railway passes presents many of the choicest beauties of English landscape. On Monday, the 21st ult., the railway was opened to the public; and it is now in active operation, with omnibuses plying from various coach-offices in town, to its station at Nine Elms.

Great Western Railway.—The directors have advertised their intention of opening this line as far as Maidenhead on Monday, the 4th inst., for passengers only. There will be eight trains each way, daily; and, on the 11th, their arrangements will be complete for the conveyance of horses and carriages: and of passengers and parcels to be booked to various parts of the West of England, by coaches in connexion with the railway.

The Brighton Railroad.—The first brick of this important undertaking was lately laid on Clayton summit, by Mr. Creasy. The building is a tower, or observatory, for the purpose of overseeing the line; there will be one also at Balcombe, and a third on the Merstham summit, taking in the whole. These towers have each a tower within them, in which is an apparatus that secures the direction of the tunnels, and during the progress of the work, the whole line is under the observation of the three resident engineers. We perceive that the following three contracts have been advertised:—Croydon, Coulsdon, and Merstham.

Sheffield and Rotherham Railway.—The works on this line are proceeding with great rapidity, and to the entire satisfaction of the directors. A good portion of the permanent rails are already laid, and it is expected the railway will be finished in August next. The five-arched viaduct at Blackburn Brook is now completed, and is the largest piece of masonry on the line, as well as a substantial and neat building. Workmen are erecting bridges over the canal belonging to the river Dun company, and over the river Don. The former will be a stone bridge, and is expected to be the handsomest on the line. The latter will be a timber bridge.—*Sheffield Iris.*

Speed on Railways.—The extreme rapidity of railway travelling was, perhaps never so strikingly exemplified as on Saturday, the 12th ult., on the London and Southampton line. An engine was appointed to follow the train which conveyed the directors and their friends, and in going, as it went almost immediately after the train, of course it could not go faster than the train; but in returning, it was found that this engine would not be wanted, and it remained at the end of the line, as far as it is at present opened, two hours after the carriages with the directors, &c., had started. This engine then proceeded to London, and it accomplished the entire distance of twenty-three miles in no longer a time than twenty-five minutes, stopping once by the way to take up a passenger, so that it may be said to have travelled at the rate of very nearly sixty miles per hour.

Railroads v. Canals.—The proprietors of the Grand Junction Railway have made offers to the manufacturers and others to carry goods between Birmingham and Liverpool, at 1s. 6d. a cwt., being exactly the sum charged by the canal, the trade of which must be superseded if the tonnage dues are not immediately lowered.—*Worcester Journal.*

IRISH RAILWAYS.

List of Railways proposed to be made in Ireland.

Ulster Railway, Belfast to Armagh,	Engineers	William Bald, F.R.S.E. M.R.I.A. &c. and Thomas Woodhouse, Esq.
Dublin to Armagh - - -	"	William Bald F.R.S.E. &c.
Dublin to Mullingar - -	"	Charles Vignoles M.R.I.A &c.
*Dublin to Kilkenny - - -	"	John M'Niel and David Aher
Dublin to Limerick - - -	"	William Bald F.R.S.E. &c
†Cork to Cove - - - -	"	Charles Vignoles M.R.I.A.
Belfast to Hollywood - - -	"	William Bald F.R.S.E.
Cave Hill to Belfast - - -	"	Ditto
†Dundalk to Cavan - - -	"	John M'Niel M.R.I.A. &c.
Dublin to Galway - - -	"	William Bald F.R.S.E, and David Henry Esq.
†Dublin to Drogheda - - -	"	William Cubitt F.R.S. M.R.I.A. &c.

The only Railway now in course of execution in Ireland is the Ulster Railway, from Armagh to Belfast.

* Act obtained for 17 miles. † Act of parliament obtained.

ENGINEERING WORKS.

Dublin Harbour.—Hyde Clarke, Esq., C.E., has caused a minute and extensive survey to be made under the sanction of some of the local authorities, for the purpose of effecting an important improvement in deepening the entrance to Dublin Harbour, by cutting through the Isthmus of Howth Head, and thus admitting the tidal current to sweep away the North Bull Sand.

Berwick Harbour.—We mentioned some months ago, that the Berwick Harbour Commissioners, among other improvements which they contemplated for the harbour, had determined to procure a dredging machine for deepening the river. Mr. Gowan, shipbuilder, is at present constructing a barge for the purpose, and it is expected she will be off the stocks in the course of a month or so. The machinery is being manufactured at Leeds. A machine of this kind has long been wanted to render our harbour what it ought to be. We can now, however, look forward to its being made equal to any harbour on the coast.—*Berwick and Kelso Warder.*

Granton Pier.—On Friday the 4th ult. a model of this important work was exhibited to a number of gentlemen assembled on the pier. It will surpass in magnitude and accommodation every notion formed of it by those who have not studied the details; it is to extend 1,700 feet into the sea, that is about 500 feet in addition to its present length; a weather wall in the centre will run the whole length, dividing a broad carriage way on either side, intersected by two openings; near the landward and seaward extremities on both sides will be projected open frame work, through which several flights of steps will lead to the different landing elevations; above will be elegant sheds and powerful cranes, to plumb the hold, so that a full cargo of a London steamer will be unshipped in the small space of four hours. From the bottom of the seaward framework to the top of the landward framework will be an inclined causeway, bound with heavy freestone to the east and west of the level carriage way already referred to. In every respect the one side will be a reverse of the other. At ebb time there will be fourteen feet of water. The new road is spacious and the inclination easy. The whole work is proceeding rapidly, and it is expected that passengers will embark from it to the coronation ceremony.—*Caledonian Mercury.*

Opening of the Edinburgh Chain Pier Railroad.—We witnessed a very novel and a very delightful spectacle yesterday afternoon, on the arrival of the "Modern Athens" steamer, at the chain pier, from Dundee. This vessel, and her splendid and powerful coadjutor, have been again and again offered goods, but heretofore the chain pier was scarcely in a condition to receive them, the expense being so great in conveying heavy goods along it. But in order to meet the wishes of the public, the proprietors of the chain pier have erected a railroad upon it, with four or five four-wheeled trucks; and these carriages were in full operation for the first time yesterday. There was fully half a ton or more on each of the trucks, and we do not exaggerate when we aver, that a youth of fourteen years of age could have drawn this with ease. We understand that one of the great objects of this railway is to give facility to passengers' luggage, as well as to articles of merchandise.—*Caledonian Mercury, May* 10.

Weymouth Harbour.—An addition to the present pier-head from the Nothe Point, of 100 yards in length, is to be proceeded with immediately. The contract is up to low-water mark, to be executed by the 1st of November, 1838; this will form an outer harbour, and no doubt be the prelude to other material improvements at this port.

Aberdeen Harbour Improvements.—Mr. Walker's plan and report have been unanimously approved of by our harbour trustees, and steps have already been taken to proceed with the preliminary departments. The expense is estimated at 85,000*l.*, but the prosperous state of our harbour funds, and the growing increase of our maritime commerce fully warrant the expenditure. When the improvements are completed, Aberdeen will have the proud distinction of affording perhaps the safest and most convenient accommodation to shipping which can be found in Scotland.—*Aberdeen Herald.*

Projected Water-works at Carlisle.—A public meeting was lately held in the Town Hall, in that city, Peter Dixon, Esq., Mayor in the chair, for the purpose of adopting measures to obtain a survey of the town, with a view to the establishment of water works and sewers. The meeting, though not very numerous, was highly respectable, and the resolutions were carried unanimously.

NEW CHURCHES.

Opening of the Wellington Chapel, St. James's Park.—On Sunday morning, the 6th ult., the splendid building lately erected in the barrack-yard of the Wellington Barracks, St. James's-park, as a chapel for the regiment that may be stationed there, was opened for the performance of divine service.

New Church at St. John's-in-the-Wilderness, Leeds.—On Monday afternoon, April 30, the foundation stone of the new church to be erected at St. John's-in-the-Wilderness, was laid by the Venerable Archdeacon Musgrave, D.D. The ceremony took place at three o'clock, amidst a large concourse of spectators. There was also a numerous assemblage of freemasons, &c., who walked in procession. The architect of the intended edifice is Mr. James Child, of Eastwood, who has also obtained the prize for the best design of the intended Odd Fellows' Hall, in Leeds, of which he is in consequence appointed architect.

Handsworth.—The foundation stone for a new church at Handsworth, near Birmingham, was laid with the usual ceremonies on Tuesday, April 24th. The architect is Mr. Ebbels of Wolverhampton, who proved to be the successful candidate in a competition. The chapel is to be a neat Gothic building, with a tower and crocketted pinnacles, of the style of about the thirteenth century; and its dimensions in the interior 66 feet 6 inches long, by 40 feet wide. It is calculated to afford accommodation for about 926 sittings, including those appropriated to the use of the Sunday School children; of these 926 sittings, 518 will be free for the use and accommodation of the poor. The estimated cost of the erection is 3,000l., of which sum 1,400l. has already been received in voluntary subscriptions. Two sums of 500l. each are expected; one from the Diocesan Church Building Society, and the other from the Incorporated Church Building Society.

Chepstow, Monmouthshire.—The contracts for the new church are taken by Messrs. Price and Roberts of Chepstow. The Architect is Mr. Harris of Bristol. The building will be erected in the early Norman style, to agree with the present Old Church. The cost, including Architect's commission, and Clerk of Works, will amount to 3,000l.

New Churches in the Metropolis.—A new church is about to be erected in Lambeth. To meet the increasing wants of the population of that large parish three new churches in the Gothic style are nearly completed in Stepney parish, and one of the new churches to be erected in Rotherhithe is in a very forward state. The new church in New-street-square, parish of St. Bride, London, will be soon opened. The building of one for the parish of St. James, Westminster, has already commenced, and the first stone of a new church on Blackheath will shortly be laid. Two new churches will shortly be erected in the parish of St. George, Southwark, and St. George's-in-the-East.

Kirmington.—A spire added to the rural church in the pleasant vale and wealthy village of Kirmington, is nearly completed;—another proof of the intention of the Earl of Yarborough to beautify his extensive and improving estates in and about Brocklesby.—*Lincoln Mercury.*

Episcopal Residence at Ripon, Yorkshire.—This building is to be immediately commenced, under the sanction of the Ecclesiastical Commissioners. The architect is W. Railton, Esq., Tenders have been advertised for, which must be delivered on or before the 25th of June.

Bristol.—The Independent Chapel at Clifton, erected by Lady Hope in 1750, has been rebuilt on an enlarged plan. The new Chapel, with the addition of galleries all round, will seat 1250. The cost, including a new Organ, and Architect's commission, will amount to 2,500l. Mr. Harris of Bristol is the Architect. The chapel is heated by Messrs. Price and Manby's apparatus, which has given general satisfaction.

PUBLIC BUILDINGS AND IMPROVEMENTS.

The Manchester and Salford Bank.—This building occupies a plot of ground on the north side of Mosley Street, at the corner of Marble Street, the front part only being devoted to the purposes of the bank, and the back occupied by a substantial and excellent warehouse. The principal façade presents a frontage to Mosley Street of about thirty-nine feet, and consists of a rusticated basement, of a somewhat massive character, upon which are placed four very beautiful attached fluted Corinthian columns, three feet in diameter, supporting an entablature, surmounted by a pediment. The proportions of the classic model (that of the Temple of Jupiter Stator at Rome) have been very strictly adhered to; the carving of the foliage of the capitals and other parts, has been very beautifully executed; and, although the greater part of the elaborate enrichments of the original have been necessarily omitted, sufficient have been retained to render the effect at once chaste and elegant. The door and windows at the basement have plain arched heads, and the two ranges of windows between the columns are finished with neat and appropriate dressings; those to the first floor have also balconies resting on the plat band, upon which the columns are placed. The public room of the bank is wainscotted throughout with Dantzic oak, the four sides being divided into compartments by pilasters, supporting an entablature extending round the room; which latter is enriched with bronzed consoles, pateræ, and lions' heads. The natural beauty of the wood has been left to supply the place of number and richness in the mouldings, being only here and there slightly relieved with an inlaying of bronzed metal. This room has an enriched coffered ceiling, which has a light and elegant appearance, contrasted with the massive character of the walls; and altogether the effect is such as is peculiarly appropriate to a room used for this purpose. The cash-counter, desks, and fittings, are also of oak, with Spanish mahogany tops; the former inlaid with bronzed metal, and the whole are arranged with every regard to convenience and utility. All the external doors and windows of the bank, on the ground-floor, are secured by the revolving iron shutters, now coming into use (patented by Bunnett and Corpe, of London); the latter, as well as the lower range between the columns, are glazed with large plates of glass, giving a dignity to the building unattainable by other means. The directors' private entrance is in Marble Street, whence a stone staircase leads to the principal story, on which is the board-room, lighted by two large windows in the Mosley Street front. This room is finished very plain, and with few mouldings, it being intended eventually to decorate it in the style now so generally in use on the continent, and which is a revival of a common practice of the ancients, as exemplified in the splendid remains of Egypt and Greece, and more particularly in the domestic edifices of Herculaneum and Pompeii; and has been treated of in the "Transactions of the Institute of British Architects," and several recent German and French publications, as the polychrony of architecture. The remainder of this floor, and the entire of the next, are occupied with apartments appropriated to the domestic purposes of the establishment; and on the upper story, the warehouse extends over the whole site of the building. The whole has been executed from the designs, and under the superintendence of R. Tattersall, Esq., of Manchester; the masonry work by Messrs. Ibberson and Co.; and the remainder of the works by Messrs. Haywood and Courtis.—*Manchester Courier.*

Helstone, Cornwall.—The new Shambles and general Market House, is intended to be opened early in the present month. The fittings of the Shambles are of cast iron, and the timbers of the roof are exposed. The cost, including Architect's commission, and Clerk of Works, will be £3,000. A new Guildhall and Corn Market is also just commenced in the same town, on the site of the old market. The contracts are taken at 2,200*l.* Both of the above buildings will be constructed of Constantine granite. The Architect of both is Mr. Harris of Bristol.

Penzance, Cornwall.—The new Guildhall and Market-house erecting by Mr. Harris of Bristol, is expected to be finished in September next. It is an imposing building, having a large dome and cupola in the centre, which is 105 feet from the level of the street The front of the Guildhall is composed of a basement and Ionic portico, with a flight of steps ten feet wide on either side. It is built of granite obtained in the neighbourhood.

FOREIGN INTELLIGENCE.

French Railroads;—the Government and the Companies.—Paris, April 30.—The railroad question is, notwithstanding the report of M. Arago, likely to end in a compromise. The greater portion will be left to the operation of public companies, and the government will be allowed to do just enough to save their credit and keep up their control. In the mean time, however, every thing stands still. But for the opposition of the government, prompted by the administration of the *Ponts et Chaussees*, from false pride, or still more unworthy motives, the railway between Paris and Havre, for which all the funds were provided three years ago, would by this time

have been half completed, and that between [illegible] commenced—whereas another year must probably elapse before the law for either the one or the other can be passed. M. Adam, the mayor and banker of Boulogne, is now in Paris, endeavouring to forward the latter project, and has himself offered to furnish 40 millions of francs towards its execution. Of this sum M. Adam takes a very large portion from his own property; the remainder he has had no difficulty in finding, chiefly in the neighbourhood of Boulogne.

The debate on the railroads commenced in the Chamber of Deputies on Monday, the 7th ult., in a contest between the Minister of Commerce, who gives up the Rouen and Orleans lines to private companies, and the parliamentary commission, which insists on giving the execution of all the lines to companies. The minister says that a road like that to the Belgian frontier, requiring three millions and a quarter sterling ought not to be entrusted to companies in France, where undertakings of the kind are in their infancy, and where the amount would not be subscribed. The partisans of companies reply, that one half of the sum requisite for the Belgian railroad is already subscribed, which is all the guarantee required by the commission. They moreover retort on the minister that there is no excess of revenue, no fund at the government disposal for the execution of the road, except raised by extraordinary and onerous means. M. Duvergier d'Hauranne it was who put forth these arguments. He said that fifty-four millions of francs were voted in 1837 for public works, and one hundred and thirteen millions in the present year for canals and works, in all amounting to three hundred millions. There was another hundred millions required for old works to be completed, making four hundred millions; and to these the minister added the demand of nine hundred millions, even supposing that the 1,100 leagues of railroads be reduced to 600. To meet this enormous expenditure, the minister counted on the surplus of the revenue, the revenue of the sinking fund, and the profits of the railroads. But excess of revenue over expenditure there never was; and were such possible, France has a magnificent possession in Africa, capable of swallowing up one hundred times any such surplus. As to the reserve of the sinking fund, that would be employed in paying the holders of the Five per Cents., whilst to count on the profits of railroads was looking far on for profit. Such were the powerful arguments put forth by M. Duvergier d'Hauranne, against government undertaking the execution of railroads. Count Mole said that the great object of the government was so to steer with respect to this question, that the country should have the great lines of railroad of which it stood in need as early as possible. He said he had no confidence in a company for the execution of a great line of eighty leagues of railroad, no one being at present well assured of either the cost or profit of such an enterprise: government alone could do it. He insisted, therefore, on the great Belgian line being left to the government, as well as that from Avignon to Marseilles, which no company offered to undertake. He would cede to private companies the lines from the capital towards Havre and Bordeaux.

On Saturday the 19th ult., the Minister of Commerce presented six projects of law conceding the following railroads:—

1. From Montpelier to Nismes. 2. From Lisle to Dunkirk. 3. From Mezieres to Sedan. 4. From Bordeaux to Langon. 5 and 6. From certain mines to the Allier. The line from Montpelier to Nismes is important, Nismes being already connected or about to be connected by a railroad with the Rhone, and with the coal mines of Alais; and Montpelier being joined by another railroad to Cette, and to the great Canal du Midi. The road from Lisle to Dunkirk traverses the richest and most populous department of France, and unites its port, the fifth in importance, with Lisle. The road from Langon to Bordeaux is lateral to the Garonne, and is the road from the latter town to Bayonne, as well as to Toulouse. On Tuesday will be presented the road to Rouen and Orleans, as well as that from Calais and Boulogne to Amiens.

Continental Railways.—The Brussels journals state that seven Englishmen, who have been employed as constructors of engines and conductors on the several railroads of Belgium from their first commencement, have embarked at Antwerp for London, whence they will go into Russia, being engaged there in similar employments on very advantageous terms.

Railroad in Italy.—The project for an iron railroad between Leghorn and Florence has been sanctioned by the government, to which the various plans are to be submitted.

Belgium.—We understand that as soon as the railroad from Ghent to Ostend is finished, there will be a daily post established between England and Belgium, through Ostend, the packets sailing between that port and Dover.

Railroad in Holland.—Some time ago the government of Holland applied to the States-General for their assent to the formation of a railroad from Amsterdam to Arnheim, by Utrecht, with a branch to Rotterdam; but the representatives, alarmed at the heavy charge it would create, rejected the proposal. It appears, however, that the King has resolved to undertake this great work by himself; for the *Staats Courant* of the 1st instant contains a royal decree for the construction of this road, which is to be ultimately prolonged to the frontier of Prussia. For accomplishing the first branch of the work a loan of 18,000,000 francs, with subsequent loans of 12,000,000 and 6,000,000 of francs at four one-third per cent., is to be raised, and secured, in the first instance, upon the produce of the railroads, and, in case the proceeds should be insufficient, upon the private property of the King, who thus makes himself guarantee to the subscribers. The decree goes on to stipulate that one fourth of the surplus receipts from the road, after payment of the interest on the sum advanced, shall be divided among the holders of bonds, and the remaining three-fourths applied in reimbursements of the capital advanced by means of drawings, with a premium or bonus of four per cent., till the whole sum advanced is paid off. When the loan is entirely discharged, the railroad, with all its appurtenances, is to become the property of the state. The period for issuing the bonds of the first series of the loan is to be fixed by the King, but it is to be raised in the course of the present year. The second series of the loan, however, is not to be opened before June 1839, nor the third before June 1840.

St. Petersburgh, April 25.—An accident has happened on our iron railroad to Zarskojeselo, the shares of which we noted in our price current so much below their original value, which is not calculated to raise the price. Yesterday was fixed for the imperial court to make an excursion on the railroad to Zarskojeselo. Their Majesties had given numerous invitations, and on the day before yesterday the officers of the household, with the necessary plate, &c., proceeded to the palace by the railroad; one of the family carriages which conveyed the plate was set on fire by the sparks from the chimney of the steam-carriage, and the engineer being so confounded that he paid no attention to the cries of the passengers, they leaped from the carriage, which was burnt with all its contents, including silver plate to the value of 30,000 roubles, which [illegible] seriously. His Majesty yesterday made an excursion on the railroad as an encouragement to the company, which was in consternation at this event. The *fête* of Zarskojeselo, countermanded yesterday, will take place to-day, but such measures will be taken that no similar accident can occur.—*Prussian State Gazette.*

Suez and Cairo.—The following is an extract from a letter dated Cairo, March 18, from Colonel Barr, Bombay army, who is making arrangements for improving the communication between Suez and Cairo, which he expects to reduce to an easy journey of 18 hours:—"We have, I think, arranged for three carriages, something of the omnibus kind, but capable of being thrown open at the top, to be in readiness for the passengers of the October steamer, also for the half-way house and mule station; the expense of the whole not to exceed the funds at my disposal (2,000*l.* from the Bombay Steam-fund Committee), and if the Pasha build the house, &c., it will leave us 500*l.* disposable for the improvement of the conveyance, tank, or buildings, as may be required."

The Pontine Marshes.—A letter from Rome, dated April 26, speaking of the arrival in that city of the Grand Duke of Tuscany, says—"He came through the marshes by way of Civita Vecchia. By his truly paternal care, not only have good roads and bridges been made there, but drains have been constructed, so that the fertile tract is nearly dry, and the inhabitants, whose numbers annually increase, now enjoy good air instead of the former ill-famed Aria Cattiva."

Navigation of the St. Lawrence.—Montreal, April 28.—The La Chine Canal is expected to be opened in about two days.

Gibraltar.—On Thursday, the 16th ult., the foundation-stone for a new lighthouse, on Europa Point, was laid by the Governor, Sir Alexander Woodford, K.C.B., &c., with masonic and military honours. The light-house will stand on a platform 38 feet square. The diameter of the column at the base will be 27 feet, and its height 60 feet. The building will be entirely constructed of hewn stone, and crowned with a lanthorn 10 feet high, with a very powerful light. It will thus form a very handsome object, as well as a most valuable acquisition.

MISCELLANEA.

Riddle's Universal Pen Holder.—Steel pens are now so generally used, that all have experienced the double annoyance of holders that will *not* hold when they are wanted, and holders that *will* hold when they are wanted *not*. The present invention seems likely to obviate both inconveniences. It is furnished with a moveable lower jaw, working with a spring which keeps it nearly a quarter of an inch from the upper one. Thus there is abundance of room to insert a pen either of quill or metal; even though not made expressly to fit; and there is little danger of its being set fast by the ink. The pen being inserted, a ring slides up over the jaw, closing the mouth upon the pen and keeping all tight. This holder is decidedly simpler than Bramah's, previously the best in use; and therefore preferable, as being less apt to need repair. The workmanship too, is as excellent as the contrivance is ingenious. We recommend it to all who use steel pens, and are content with a holder which does not attempt any of the numerous contrivances to give elasticity to them.

Ironmasters' Quarterly Meetings.—The *Staffordshire Examiner* states that an arrangement has been made by the ironmasters, merchants, &c., which will in future remove all uncertainty as to the time when these meetings shall be held. "The rule by which they are now to be determined is, that the Birmingham quarter-day shall in all cases be the second Thursday in the month following the Christmas, Lady-day, Midsummer, and Michaelmas quarters; that is, that it will be the second Thursday in January, April, July, and October. So that, instead of being determined by the variable feasts, as formerly, they will now follow a fixed, well-known, and invariable rule. By this arrangement there will always be a clear week after the close of the month to allow for posting up accounts, as the quarter-day can never fall earlier than the 8th nor later than the 14th of the month Of course the Wolverhampton, Walsall, Dudley, and Stourbridge quarter-days will be determined by that of Birmingham. The following, therefore, will be the quarter-days at these places for the two ensuing quarters of this year:—Walsall, Tuesday, July 10—Tuesday, October 9;—Wolverhampton, Wednesday, July 11—Wednesday, October 10;—Birmingham, Thursday, July 12—Thursday, October 11;—Stourbridge, Friday, July 13—Friday, October 12;—Dudley, Saturday, July 14—Saturday, October 13."

There is a work now exhibiting at the Egyptian Hall, which is of its kind unique; an enormous specimen of *metallic embossing*, being a copy of Lebrun's well-known picture of the Battle of Arbela, in copper; and, what is more remarkable, the work of a single hand. The artist is a M. Joseph Szentpéterq, silversmith of Pesth; the labour, we are told, occupied four years, and must have been immense, for not only is the crowd of figures enormous, but the relief required to throw them out so bold, as to offer difficulties which, at first sight, would appear insurmountable. Patience and genius, however, will prevail at last. It is said that after having been at work for two years on the subject, the artist was compelled to relinquish his plate, owing to a flaw in the copper, and to recommence his minute task; so satisfactorily, however, did he at last terminate it as to have been admitted, in right of its excellence, an Honorary Member of the Guild of Jewellers at Vienna. We should be glad to hear of this work finding a purchaser in one of our noble amateurs.—*Athenæum.*

NOTICES TO CORRESPONDENTS.

Mr. Lister's communication came too late for insertion in the present number, but shall find a place in the next: we shall be happy to receive from him any farther communication.

The account of Messrs. Price and Manby's apparatus, and other papers, are postponed in consequence of the crowded state of our columns.

We shall feel obliged to the Profession, for accounts of works in progress; particularly in the country.

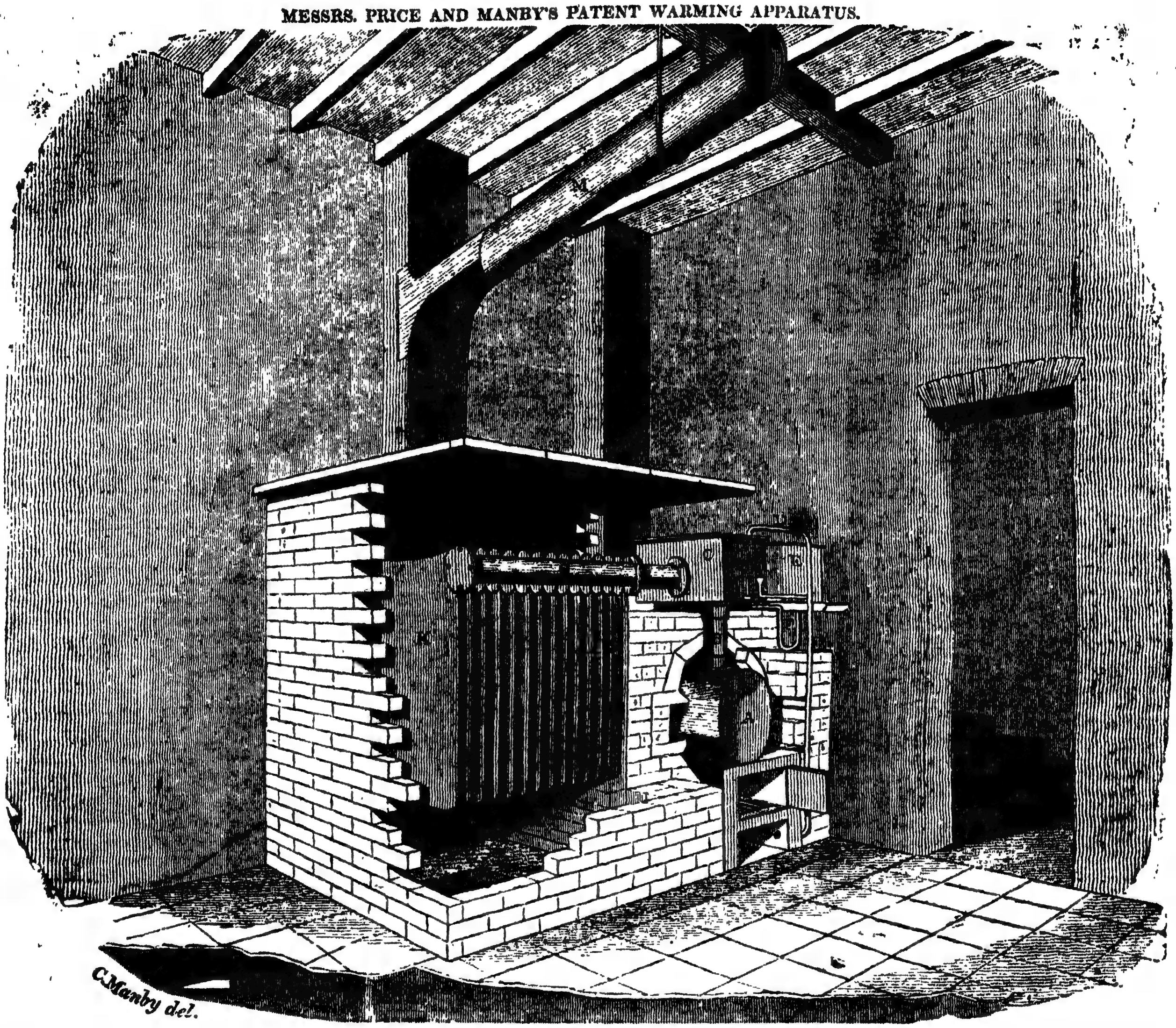
The first number of the Journal, will be reprinted and ready for delivery on the 14th inst.; when complete copies may be had.

SCHOOL FOR THE INDIGENT BLIND,

ST. GEORGE'S FIELDS.

(Continued from page 212.)

MESSRS. PRICE AND MANBY'S PATENT WARMING APPARATUS.



We recur to this building, in order to redeem our pledge of exhibiting the system of warming and ventilating adopted in it. The "Patent warming apparatus" of Messrs. Price and Manby of Bristol, and John Street Adelphi, is employed for this purpose: and we are enabled by the kindness of the Patentee, to lay before our readers a full description of the apparatus, illustrated by a drawing. The other drawings referred to below, will be found in the last number of the Journal, pp. 209, 210.

A is a wrought iron boiler set in brickwork, part of which is removed to show more plainly the construction: underneath, is a furnace with bars and door as usual; and lowest of all, a cast-iron ash-pan, kept constantly full of water for the purpose of preserving the bars, as well as assisting combustion by the steam raised by the falling ashes. Above the boiler, and connected with it by a vertical pipe B, is an expansion box C; whence a horizontal pipe G, leads to a series of narrow cast iron vessels K, placed vertically in a brick chamber, leaving a certain narrow space entirely open between each pair. This brick chamber is provided with a flue, opening in its bottom, to admit cold air freely from the outside; and with another rising from the top, to take off the warm air for use. A branch of this warm air flue is shown at M: such branches are of course provided in size and number proportionate to the rooms to be heated. The flues are made of zinc plate; they are coated with wooden covering boxes, the intervening space being well rammed with saw-dust: the amount of protection needed must be determined by the degree of exposure to which the flue is liable. Each of the water vessels K, is connected at bottom with a pipe communicating with the lower part of the boiler, and thus completing the circulation. The whole circle of pipes and vessels described, is supplied with water from the feed cistern E, by means of the syphon pipe F. A ball cock in this cistern keeps the water at a uniform level.

The apparatus being thus ready, a fire is lighted under the boiler: as the water warms, it rises through the pipe B into the expansion box C; thence it passes by the pipe G into the vertical vessels K, from the lowest parts of which, the coldest water of all constantly passes through the connecting pipe to the bottom of the boiler. This circulation will evidently be kept up, so long as any difference of temperature exists; whether that difference arise from the gradual heating of the boiler on lighting the fire, the gradual cooling after the fire has gone out, or the action of the cold air on the water boxes K. The circulation attains its greatest velocity when the water in the boiler reaches the boiling point, beyond which it is not carried. To guard against the danger of exceeding the proper degree of heat, the expansion box C is furnished with a pipe D, brought down so as to open into the ash pit, as shown in the drawing. Thus the steam necessarily arising from water kept constantly as near as possible to the boiling point, is disposed of; partly in the form of water supplying the ash pan, partly in the form of steam assisting

the combustion of the fire. A thermometer is attached to the front of the expansion box, to indicate the temperature of the water within.

Such is the circulation of the water; that of the air remains to be described. It enters the hot air chamber, as we stated above, at the bottom, under the water vessels K. The air in contact with the lower part of these vessels is heated by them, and consequently rises between them, meeting in its progress with parts hotter and hotter, till it attains its greatest temperature as it escapes from them to the flue at the upper part of the chamber. To supply its place, a constant stream of fresh air pours in from the lower flue. The temperature of the air as it quits the hot air chamber is about 130 deg.: in passing along the flues it loses from 20 to 30 deg.; and enters the rooms which it is designed to warm, at from 100 to 110 deg. It mingles almost imperceptibly with the air of the room; no current is felt at a very short distance from the regulator by which it enters; and while within the regulator the thermometer has been observed to stand at 100, at a distance of 18 inches it has been found only at 65.

The introduction of a body of warm air into a room in the manner described, necessarily implies the abstraction of a similar amount of air to make room for it. The air thus removed may be made to supply the warm air chamber of the stove; in which case less heat is lost. But at the same time no ventilation is gained, the same air is used over and over again: this mode then is applicable only in cases where there are but few persons to breathe the air, in proportion to the size of the room. In the instance before us, ventilation being very desirable, the air ejected by the constant influx of the warm air is conveyed away by ventilating flues, &c. The system of ventilation thus carried into effect, we proceed to describe: it appears very complete and very simple.

To consider first the arrangement in the Eastern wing, where the girls' work-room is warmed by Mr. Price's apparatus. S, fig. 4, is the furnace room in the cellar beneath the floor shown in the plan, the boiler being represented by the parallelogram, and the vertical water vessels by the series of parallel lines. The heated air rises through a flue which enters the work room H, by an aperture at *w* at the height of about 4½ feet from the floor. At the other end of the room, six holes, *vv*, fig. 3, are provided just above the floor, communicating with ventilating shafts, built in the walls. These holes will be seen better in fig. 9; where they are shown, three on each side of the door; with corresponding apertures *vv*, &c., above the upper ceiling, whence the vitiated air is discharged through Louvre openings. It will be seen then, that the circulation of air in the room is complete; the fresh warm air at the one end constantly entering, and a corresponding quantity of colder air constantly escaping after use, by the ventilating holes on the level of the floor at the other end. The flue from the hot air chamber, rises beyond the opening described as admitting it into the work-room, and terminates in a grating *w*, in the dormitory E, fig. 7. The opening into the work-room being closed when the day's work is over or the room warm enough, the heated air finds its way into the dormitory, which is thus likewise warmed.

In the centre compartment of the building, another apparatus is placed in the cellar under the kitchen, N, fig. 3. Its position is there indicated by dotted lines; but it will be seen better as shown in section, in the cellar at the right side of fig. 10. From the warm air chamber of this apparatus, flues lead off right and left to *w*, *w*, regulators in the centre of the floor of P and O, fig. 3, the boys' and girls' dining rooms. Ventilating holes *v*, *v*, &c., are provided in the ceilings at the farther ends of the rooms. Another flue is carried to the chapel or music room on the first floor, A, fig. 6, which it enters by the regulators *w*, *w*.

Several rooms in the Western wing are warmed by a third apparatus placed in the furnace room S, fig. 5. This room is but little below the level of the apartments on the ground floor; so that the regulators *w*, admitting the hot air into the boys' work-room K, are placed higher than in the former case, being about seven feet above the floor. The position of the ventilating shaft at the other end of the room is indicated at *v*, fig. 3. By this same apparatus also, two other rooms on this floor are warmed; the boys' washing room Y, fig. 5, by the flue nearest to the front wall of the furnace room S; and the shoemakers' room X, by the flue entering at *w*, the course of which across the gateway and along the ceiling of the washing-room, is indicated by the dotted lines. The boys' dormitory M, may like that of the girls be warmed at pleasure, by means of apertures in the floor furnished with moveable shutters, represented by *w*, *w*, figs. 6 and 8.

It will be seen at once, that the general principles of warming and ventilating here adopted are the same as those employed in connexion with the late Mr. Strutt's apparatus, better known perhaps as Sylvester's. These principles must in a great measure be common to all; but Mr. Price's apparatus certainly exhibits some important improvements on preceding contrivances for the heating of the air. The grand improvement is the employing of water as a means of heating the plates over which the air is to pass; for thus the danger of over-heating and burning the air is avoided, and the consequent smoke and dirt arising from leakages in the cockle, so frequent in Mr. Strutt's plan without the very greatest care, obviated. Still, some dirt comes over with the heated air; as may be seen on one or two of the ceilings, where the aperture for its admission is near the top of the room. As the hot air chamber, however, is perfectly separate from the furnace and smoke flues, we are inclined to agree with the patentee in referring this imperfection to the impurity of the air admitted. If it comes in, loaded with city smoke, it certainly meets with no means of purification in the apparatus. But a fine wire gauze across the aperture of the flue, is found to intercept these impurities very perfectly. Another advantage of the use of water, is that the heat is much longer retained: the action of the hot water goes on long after the fire is out; and the facility of keeping up the heat at night is considerably increased by the use of this circulating *medium*. The apparatus itself is ingeniously contrived with a view to obtaining in a small space a vast area of heating surface for the air to pass over.

To give an idea of the efficiency of the apparatus, and the expense of this mode of warming, the patentee has furnished us with the following account of the dimensions of the rooms; and the fuel used, is stated by him to be on an average about 1¼ cwt. per day for each apparatus.

In the East wing;—

	ft.		ft.		ft.	Cubic ft.	Cubic ft.
Girls' work room	117	×	25	×	15	......	55,125

In the Centre;—

Boys' dining room	52	×	25	×	16	= 20,800	
Girls' dining room	52	×	25	×	16	= 20,800	
Music room, of irregular shape					....	= 36,167	
							77,767

In the West wing;—

Boys' work room	165	×	25	×	15	= 61,875	
Washing room . .	37	×	21¼	×	15	= 11,793	
Shoemakers' room	37	×	21¼	×	15	= 11,793	
							85,461

In this account, it will be seen, the occasional warming of the dormitories is not included. It should be observed also that the number of windows is very considerable: 18 in the girls' work room, 19 in the boys'; 7 in each dining room; and 5, of very considerable size as our elevation shows, in the music room or chapel. Indeed the great extent of the building, and the vast amount of outside walls, present no slight difficulties to those who have undertaken to warm it. The apparatus in the Western wing has been in use two winters; we give below, such particulars as we have learned by inquiry on the spot, respecting its efficiency. We think it however but fair to state that this being the first, is probably the least efficient apparatus of the three. It is wished to keep the Boys' work room at about 54 degrees of temperature; which in ordinary states of the weather is effected without difficulty, except when the fire has been allowed to go too low at night. During the extremely cold weather of last winter, the freezing fresh air from the outside was not admitted to the stove, but the supply was taken from the room itself; sufficient ventilation being for once supposed to be gained by the numerous windows and the doors of the room. The washing room and the Shoemakers' room were also warmed; the latter requiring however an additional fire in the coldest weather. The dormitory does not seem ever to have had the hot air admitted. The consumption of fuel averaged about 2 cwt. a day, which agrees sufficiently with the account given above, as it will be seen that in the Western wing there is decidedly the greatest quantity of space required to be heated.

It is not however by the experience of one particular building that an apparatus like Mr. Price's is to be judged; and the public have before them abundant other instances of its use by which to form their opinion. From a long list of references, we select the following cases of the application of this apparatus, to the warming of buildings of various descriptions. In London: British Museum—Elgin and Egyptian Galleries; Pantheon, Oxford-street—the Bazaar; Messrs. Barnetts, Hoares, and Co., Lombard-street—Banking house. Bristol: Custom House—Long room. Liverpool: Mechanics' Institution—theatre, museum, and class rooms. Leicester: County Lunatic Asylum—galleries, day rooms, cells, &c. Birmingham: Town Hall—great room and corridors. Penryn Castle, Carmarthen, the seat of G. H. D. Pennant, Esq.—vestibule, great hall, staircases, corridor, dining room, library, keep, &c. The new Union poor-houses of Boston, Guildford, Horncastle, Louth, Buckingham, Oundle, &c.

REVIEWS.

History and Description of the London and Birmingham Railway. By Peter Lecount, F.R.A.S. and Thomas Roscoe; Part I.: London: Charles Tilt.

The commencement of this work augurs well for its success; and if the succeeding numbers prove equal to the first, it will be well deserving of public support. The four engravings in the part before us, are spiritedly executed. They comprise a view of the entrance to the railway at Euston Square: the viaduct over the river Colne near Watford, painted by G. Dodgson, in which the landscape is exquisitely drawn and possesses considerable spirit; a view of the Berkhampstead station; and another of the entrance to the Camden town depôt, showing the two stationary engine chimneys, &c. The letter press is also interspersed with some clever wood engravings of works on the line.

The first chapter commences with a comparison of the railway in respect of the magnitude of its works, with the greatest undertakings of ancient times.

The London and Birmingham Railway is unquestionably the greatest public work ever executed, either in ancient or modern times. If we estimate its importance by the labour alone which has been expended on it, perhaps the Great Chinese Wall might compete with it, but when we consider the immense outlay of capital which it has required,—the great and varied talents which have been in a constant state of requisition during the whole of its progress,—together with the unprecedented engineering difficulties, which we are happy to say are now overcome,—the gigantic work of the Chinese sinks totally into the shade.

It may be amusing to some readers, who are unacquainted with the magnitude of such an undertaking as the London and Birmingham Railway, if we give one or two illustrations of the above assertion. The great Pyramid of Egypt, that stupendous monument which seems likely to exist to the end of all time, will afford a comparison.

After making the necessary allowances for the foundations, galleries, &c., and reducing the whole to one uniform denomination, it will be found that the labour expended on the great Pyramid was equivalent to lifting fifteen thousand seven hundred and thirty-three million cubic feet of stone one foot high. This labour was performed, according to Diodorus Siculus, by three hundred thousand, and by Herodotus by one hundred thousand men, and it required for its execution twenty years.

If we reduce in the same manner the labour expended in constructing the London and Birmingham Railway to one common denomination, the result is twenty-five thousand million cubic feet of material (reduced to the same weight as that used in constructing the Pyramid) lifted one foot high, or nine thousand two hundred and sixty-seven million cubic feet more than was lifted one foot high in the construction of the Pyramid; yet this immense undertaking has been performed by about twenty thousand men in less than five years.

From the above calculation has been omitted all the tunnelling, culverts, drains, ballasting, and fencing, and all the heavy work at the various stations, and also the labour expended on engines, carriages, wagons, &c.; these are set off against the labour of drawing the materials of the Pyramid from the quarries to the spot where they were to be used—a much larger allowance than is necessary.

The second chapter carries on the history of the commencement of the undertaking, begun in the first: it describes the character of the country between London and Birmingham, exhibiting the difficulties which had to be surmounted; the various lines surveyed, and the one finally adopted.

The third chapter relates the proceedings before parliament, including the description of traffic proved as likely to pass along the line, and also the estimated cost of construction. Here the ingenuity of the author (we presume Mr. Lecount) is put in requisition, to account for the enormous difference between the estimate as laid before parliament, and the probable ultimate cost of the finished work. We cannot resist the temptation to lay before our readers, the case as made out by Mr. Lecount.

The Estimate laid before Parliament was as follows:—

Excavations and Embankments	£179,000
Tunnelling	250,286
Masonry	350,574
Rails, Chairs, Keys, and Pins	212,940
Blocks and Sleepers	102,960
Ballasting and laying Rails	102,960
Fencing	76,032
Land	250,000
Water Stations and Pumps	3,600
Offices, &c.	16,000
Locomotive Engines, Wagons, and Coaches	61,000
Contingencies	294,648
	£2,500,000

Before drawing to a conclusion with the present work, we shall more particularly allude to the increase which has taken place in this sum. It will, therefore, be sufficient at present to say, by way of explanation, that in an undertaking of this kind there are certain works which are of a fixed nature, and which can be fairly taken at the current prices of the day; but there are also others variable both in quantity and price.

For instance, the engineer knows he has, at least, a certain quantity of earth to move, and that, as he crosses over or under a given number of public highways, he must have a determinate number of bridges. All these things are positive data for an estimate, and constitute the principal sums in what are called the contract works; these formed an item of 1,649,155l. in the revised estimate of the engineer, and they were actually let for 1,621,821l. or 27,334l. below the estimate; to this 76,160l. has to be added, for the extension from Camden Town, where the railway originally began, to Euston Square.

From the great increase in prices, which took place almost immediately after the letting of the works, no less than seven contracts were thrown on the Company's hands, and of course these were the most difficult and expensive parts of the works; and in each case, the directors had to purchase all kinds of implements and materials at a vast expense, including five locomotive engines, while, from the times at which these seven contracts took to complete them, there was very little possibility of transferring these implements (technically called the Plant) from one contract to another. This, although a very expensive process, was the only one to be followed, or the line could not be opened under at least a year beyond the time contemplated.

It is a well known fact, that from the great rise in prices there is hardly one of the contractors who has made a sixpence by the three years' labour, and some have absolutely lost money, but have spiritedly performed their engagements whenever it was possible for them to do so. The difficulties of particular works will be adverted to in a future place; in the mean time the reader may be reminded of another class—namely, the variable one.

The contract works, consisting of definite portions of the whole, being let, as the land agents advanced in their labours, a series of what are called extra works arose; these consisted of bridges over private roads,—of bridges to join lands severed by the railway,—of culverts, drains, watering places, new roads, gates, fencing, approaches to bridges, &c., forming a large portion of the whole, and which could only be ascertained as the agreements were entered into between the owners of the land and the Company's agents.

It is obvious the engineer can have neither a knowledge of the extent of these, nor of their cost, except in a very general way; he only gains full information as he has extracts sent him from time to time from these agreements, showing what has been consented to on the part of the company, and he then gives his orders for the various works to be done. It is evident therefore that the total cost of these constantly increasing and variable works, many of them, as in the case of bridges with extensive approaches, costing several thousand pounds, cannot be fully ascertained till the line is nearly completed.

Another variable class of items are those denominated additional works. These consist of alterations of various kinds which must constantly arise in all great undertakings, such as increasing the slopes in particular parts where, on cutting into the ground, it is discovered to assume a different character to that of the borings taken right and left of it, from which borings alone could a judgment be formed in the first instance; in some cases springs of water are cut into, and have to be drained, in others rock is come upon, where no geological indications, or any result from the borings, would lead any one to suspect its proximity; from similar causes bridges have to be enlarged in their foundations, and where the slopes have been increased, in their superstructure also; water has to be procured for the adjoining occupiers of land at a considerable expense; and there is a constant and unavoidable increase in the outlay from these and other causes, over which no human foresight could, by any possibility, have the least control.

The description of the railway, considering the number of interesting works on the line, will we think be very limited if the letter press of the five remaining numbers be not extended. We suggest to the publisher that an additional eight pages would not be lost in the sale of the work. And there are ample materials for filling up the extra space with information highly interesting both to the public and the professional reader.

Reply to "A few Plain but Important Statements upon the Subject of the Scheme for supplying Leeds with Water; by Henry R. Abraham of London." By John W. Leather. Leeds: 1836.

In a former number of our Journal (No. VIII. p. 184), we noticed Mr. Abraham's pamphlet; and gave rather a lengthened extract, without making any comment. We have since received the reply of Mr. Leather, the other candidate in the field; and we proceed to make extracts from his pamphlet in the same manner as we did from Mr. Abraham's. There is much useful matter connected with the supply of water, to be culled from the statements of both parties. We understand that the question in dispute has been referred to six eminent hydraulic engineers, who are to examine the correctness of the various statements, and to report their opinion to the company. We consider that this is a very wise act on the Company's part; and it will remove a heavy responsibility from the Directors.

I now proceed to Mr. Abraham's pamphlet; he says, page 5:—

"You have stated, 'that before the works can be completed, 210,000 per-

sons will require water.'—Mr. Leather's evidence in the Committee of the House of Commons."

Mr. J. W. Leather's evidence is here professed to be quoted. His evidence, however, was, that the works might be brought into full operation in 1841; that, at that time, there might be two-thirds of 142,000, or 94,600 persons, occupying 20,000 houses, wanting water; and, if we allowed 60 gallons per house (being about 12½ gallons per individual), they would require 1,200,000 gallons per diem.

He afterwards went on to say, that, in 1851, there might be half as many more, or 142,000 persons, occupying 30,000 houses, wanting 1,800,000 gallons per diem. Mr. A misquotes in the outset; but let that pass.

* * * * * * *

Mr. Abraham says, page 6—

"At Eccup and Alwoodley, near Leeds, there are springs of water whose conflux yields a run of 230 gallons per minute, independent of any assistance from rain: this gives 18,165,050 cubic ft. per annum."

230 gallons per minute gives 19,397,946 cubic ft. per annum, when correctly calculated. I notice this merely incidentally. A gentleman claiming such superior accuracy, and actually going to half a gallon in his assumption of data, should be careful that his results do not show an error of upwards of a million cubic ft. But the discrepancy between his present and his former statement is many millions of cubic ft. In his Report, jointly with Mr. Mylne, dated August 31 1835, he says—"Upon examining the account of the weekly gauges of the various springs which unite in the Eccup Beck, the fluctuation appears to guarantee at its minimum flow a quantity equal to 432,000 gallons *per diem*."—Now, 230 gallons per minute being, in round numbers, nearly 332,000 gallons per diem, it seems probable that his error may have arisen from a mistake of the first figure: however, be his error where it may, it is clear that, in 1835, he stated the minimum flow of the springs at 432,000 gallons per diem, and this is equal to 25,301,668 cubic ft. per annum.

He then concedes that, besides the springs, we may get 11¾ ins. of rain into our reservoir, making, he says, 51,183,000 cubic ft.

We then have Springs	25,301,668	cubic ft.
Rain	51,183,000	„ „
Being a total of	76,484,668	„ „
The supply we stated as likely to be required in 1841 was	70,280,000	„ „
Leaving an excess of	6,204,668	cubic ft.

to supply evaporation from the surface of the reservoir.

Mr. Abraham, with minute accuracy, proceeds to calculate the amount of this evaporation. He tells you that "evaporation is and must be equal to the fall of rain." He then tells you that "in summer height $\frac{3}{10}$ of an in. is vaporized each day."

The result of a number of years' experiments by Dr. Dalton, Mr. Daniell, and Mr. Howard—three of the greatest names in the science of meteorology—state the maximum of evaporation to take place in July; the average of their observations giving about 4 in. as the quantity for that month. This gives an average of 0.13 in. per diem; it is, however, possible, nay probable, that, with a strong wind and a hot sun, evaporation may, on some days, amount to 3-10ths of an inch; but Mr. Abraham assumes this quantity for 90 days of summer. This would give - - - - - - 27 in.

He assumes $\frac{1}{20}$ in. for 90 days of winter, which would give - 4½ „

and $\frac{2}{10}$ .... 185 .... of autumn and spring - - 37 „

Making the total evaporation per annum - - 68½ „

He surely thought he was in the tropics!

Dr. Dalton's experiments	at Kendal,	for 3 years,	give 25.157 in. per annum.	
Mr. Howard's	at Tottenham,	8½ years	..	30.467 „
Mr. Daniell's	in London,	3 years	..	23.974 „

We might fairly take Kendal as being the most analagous to our district, not only in latitude, but in elevation above the sea,—consequently as most likely to assimilate to our district in its mean temperature, and other circumstances on which evaporation depends; but we will take the average of the three, or 26.53 in. It is therefore clear that 26.53 in.—say 26½, instead of 68½ in.—will be the quantity to be deducted for evaporation per annum.

But now a few words as to the extent of surface over which this evaporation is to take place. Mr. Abraham presumes that he has proved that our reservoir will never have more than 11,000,000 cubic ft. in it; while he assumes, in the data upon which this result is founded, that the reservoir will be nearly full. Mr. Abraham ought to know, that, in a reservoir to be formed by throwing an embankment across a valley, having converging sides, like that of Eccup, the surface of the water diminishes (though not in any precise ratio) as the cubic contents of the water diminish. I can supply him, however, with a few facts as data for any further calculations he may feel disposed to waste his time in making. In the situation where the Parliamentary reservoir is shown (though Mr. A. knows that we proposed to place it in a more advantageous position, as we so stated in our evidence):—

	Acres.	Cubic ft.	
If the water were 45 ft. above Will Redhoff's spring, its area would be	48½; its cubic contents	39½ millions.	
.... 40	40½	.... 29½	„
.... 35	30	 22	„
.... 30	26	 15	„
.... 25	21	 10	„

So that when reduced to 11,000,000 cubic ft. its area would be about 22 acres. But as this 11,000,000 cubic ft. is the maximum quantity of water which Mr. A.'s calculations (if they go to prove any thing) go to prove that we should have in our reservoir, he ought not to take so large an area. Half this area would be as much as Mr. A. ought to take, if he contends that he is right in his other positions; *i. e.* if he contends that we shall never have more than 11,000,000 cubic ft. of water, he must admit that we have not 40 acres exposed to evaporation.

If, on the other hand, he contends that we have 40 acres exposed to evaporation, he must admit that we have 30,000,000 cubic feet of water.

But to return to real quantities. I will not affect an accuracy which the subject does not admit of, by pretending to separate the seasons. But I will allow (and I am sure it is a liberal estimate, seeing that the reservoir will have least area when the vaporizing power is most active), that, on the average of the whole year, we shall expose 20 acres to this power.

We still want one further correction before we ought to satisfy Mr. Abraham's precision in estimating the quantities. It is clear that "filtration, irrigation, and evaporation," can stop none of that rain "in its meanderings and lazy percolations towards the reservoir," which actually falls upon the surface of the water. And here too, even the dew (of which more anon) will make, without deduction, its slow but sure deposit of 5 inches per annum.

We have only taken half the rain in the above estimate. We shall therefore have, towards compensating the evaporation, the other half of the rain, viz. 11¾ inches, and the dew 5 inches, making 16¾, or 16.75 inches; which, deducted from 26½ inches, or rather from 26.53 inches, (I beg Mr. A.'s pardon, it behoves me to be precise when dealing with gentlemen who go to half a gallon,) leaves 9.78 inches as the excess of evaporation over the compensating corrections. These 9.78 inches upon 20 acres, give 710,028 cubic ft., as the real probable quantity of uncompensated evaporation. Mr. Abraham states the quantity at 9,456,150 cubic ft.

We have then to deduct this quantity from the gross excess of the supply beyond the demand, viz. *vid. supra*	6,204,668	c. ft.
Deduct evaporation	710,028	„
Leaving the net excess	5,494,640	„

Or, in round numbers, about 5½ millions of cubic feet.

But Mr. Abraham tells you that above 7,000 000 cubic ft. will remain in the Eccup reservoir which cannot be drawn off. Fortunately he gives his *data* for this calculation. He says—p. 12—"A reservoir is to be formed at Eccup, 45 acres in area. The conduit from this is to be two feet from the bottom, and the conduit itself 30 inches in diameter—and it should have a head of a foot to work with; then above 7,000,000 cubic ft. must be deposited before the service can be carried on with regularity."

Now one foot deep upon 45 acres gives 1,960,200 cubic feet: it is therefore clear that Mr. Abraham has calculated upon the loss of between three and a half and four feet over the whole area of 45 acres. I have shown above that when the water is drawn down to 25 feet above Will Redhoff's spring, its area is reduced to 21 acres; and, when it should be drawn down to only four feet above Will Redhoff's spring, its area would be reduced to little more than half an acre—6-10ths of an acre. Then 4 feet is the depth at the deepest point, (round the perimeter of the water the depth is nothing, the water meeting the ground,) therefore, 2 feet average depth over 6-10ths of an acre, or 52,272 cubic feet, would be the real quantity, instead of upwards of 7,000,000 cubic feet, as Mr. Abraham has stated,—taking all Mr. Abraham's data, except his erroneous assumptions of uniform depth over an area of 45 acres.

Mr. Abraham knew, however, that we purposed to alter the site of the Parliamentary embankment, as we so stated in the Committee of the House of Commons. We should so execute the reservoir that we could draw off the whole of the water when we so wished, and for the supply of the town, as much as is desirable, *i. e.*, within two feet of the lowest point of the reservoir. Instead of 7,000,000 cubic feet, or even 52,000 cubic feet, the quantity left in the reservoir would not amount to 20,000 cubic feet—or, 1-10th of a day's supply. With respect to the 3,500,000 gallons which Mr. A. states would be left in the Weetwood reservoir, it is only necessary to observe that there would have been a large quantity (though, like the other, it is greatly magnified,) had the reservoir been executed exactly as shown in the Parliamentary plan, but this we should remedy in execution, and no loss would arise.

* * * * * * *

And now with respect to the quantity of downfall water absolutely lost. Mr. Abraham's theory appears to be that "one-half" of the downfall (be that downfall what it may) is lost in "filtration, irrigation, and evaporation." Thus out of 23½ inches of rain, he allows that 11¾ inches may run off into our reservoir;—and, besides this, he allows us to recover (after "filtration") from the other half, the *minimum* flow of the springs. This *minimum* flow, taking his own account of 432,000 gallons per diem, amounts to about 6 inches of water per annum over our whole gather. He has, therefore, only 5¾ inches left for the support of evaporation and vegetation during the whole year; and, had he founded his calculation on a downfall of 20 inches or 18 inches—which, he contends, are probable occurrences—he would have shown, by the same process of computation, that evaporation and vegetation would only have 4 inches or 3 inches, in these respective cases, to depend upon.—A most strange theory truly! In such years as these he would find a woful want of "the dew."

Our calculation was, that evaporation and absorption for the purposes of vegetation would cause an absolute loss of 10 inches per annum, let the downfall be what it might; and that the excess of the downfall over this quantity (and this excess only) would be returned to us by the springs and living streams. Mr. A.'s theory (if we could have entertained such a theory) would have been very much more favourable to our case in a dry season than our own. Thus,

supposing a downfall of 22 inches, by our own notions we should get but 12 inches, while Mr. Abraham's theory would yield us 17 inches:—17 inches would exceed 1,200,000 gallons per diem, after allowing all deductions; and, therefore, we might contend that Mr. Abraham's theory had proved our case. But we cannot recognise such a theory.

The real question hinges on the probable amount of the downfall. We are taunted with not having ascertained this downfall. No engineer hitherto employed has ascertained this—no engineer, before ourselves, has even recommended the fixing of a rain gauge. How many years would you have to extend your observations before you could be satisfied that you had ascertained the minimum yield of your district? The proposition is absurd. You must proceed on some assumption, and it is only necessary to show that our assumption is within the bounds of probability.

In reading an article on Meteorology or Rain some years ago, I had noted, from Rees's Cyclopædia, the fall of rain at several places; and I had noted also, a general observation that the average rain for England was 31 inches.* This note was made without any reference to my evidence on the Leeds Water-works: but, when I came to consider the subject with that view—when I considered the circumstance of our district being a tract of high and undulating ground, and forming the ridge between the valleys of the Wharf and the Aire—when I examined the quantity of rain falling in other places of which I had returns—when I compared the circumstances of these places and of our own district, and weighed well their analogies—I judged (and I trust I can satisfy you) that the assumption of 31 inches in our district was most reasonable.

Mr. Abraham tells you he has observations of the rain falling in a wet adjoining county—Lancashire; but he mentions no place. I can give you the results of observations made at several places in this wet adjoining county.

	Inches.
Dr. Dalton's observations for twenty-five years at Manchester, give	33.87
Observations for 18 years at Liverpool.....	35.10
.... 10........Lancaster......	45.00
.... 15........Townley	41.50
.... 2........Crawshawbooth	60.00
These places are all in Lancashire.	
Again, Obs. for 9 years at Kendal give ..	56.20
...... 7........ Keswick	67.50
...... 3 Garsdale, Westmorland	56.30
...... 3 years at Fellfoot ,,	55.70
At the gauge of the Sheffield Waterworks Company above Sheffield, there fell, in 1836	45.90

I might, with as much fairness, have adduced the above places in proof that my quantity is under rated; and indeed, with more of analogy on my side than Mr. Abraham has when he brings York and London, to show that this quantity is over-rated. Look at the situation of York, which, as Professor Phillips says†—"stands in the centre of perhaps the most uniform "and extensive vale in England, reaching from the mouth of the Tees to the "estuary of the Humber, a length of 70 miles, with a breadth of from 15 to "25 miles. In this vast space, no ground rises more than 100 or 150 ft. "above the level of York; and the Minster, elevated 200 ft. from the ground, "looks down upon an area of above 1,000 square miles, in which hardly any "object, whether of nature or art, rises to within 100 ft. of its summit."

"To this peculiarity of its geographical situation," he says, "we may "probably attribute the remarkable general regularity of the curves of mean "temperature at York:" and yet, even here, Professor Phillips's observations for 1833-34 give 25.7 inches.

Turn, on the other hand, to our district—a tract of high ground of very undulating surface—the ridge between the Wharf‡ and the Aire—having a deep valley on either side—just the circumferance to call into full activity the real sources of rain,—"to say nothing of the unequal circumstances of humidity in the different strata of the air, the incessant play of the currents "generated by the inequalities of the surface must incessantly mingle toge- "ther volumes of unequal temperatures, and thus create a greater amount of "rain than could be produced" in the lower and more level situation of York, where more uniform laws prevail.

In a year in which only 24 inches of rain should fall, we should have, according to Mr. Abraham's own theory, about 18 inches available for supply, and this would yield us 1,333,800 gallons per diem. I stated in my evidence that I had no doubt this quantity might be depended upon from the Eccup source; and "I thought it probable that, by the construction of a sufficiently capacious reservoir, the still higher quantity of 1,800,000 gallons might be secured without the aid of any auxiliary source." We further stated that the gather to our reservoir might be increased, if found necessary, by cutting a catch-water drain; which, with the friendly disposition of Lord Harewood, we thought might be done without any further Act of Parliament. I therefore trust that I have allayed any fears which Mr. A. may have excited, and that I have proved a high probability, to say the least, that the Eccup source will be sufficient for the requirements of the town for many years to come.

* Dr. Dalton gives it 31.3 inches.

† Report of Third Meeting of British Association for the Advancement of Science.

‡ Wharfdale is proverbially wet.—As an illustration of this popular opinion, I may quote the questions put to me by an Honourable Member—who was born and brought up in Wharfdale—when under examination in the Committee of the House of Commons:—

Mr. John W. Leather, examined by the Committee—"Your district is on the edge of Wharfdale? Yes.

"Do you think there is any place in the kingdom where there is more rain falls than in Wharfdale? I think there are places where more rain falls.

"Do you know another? I should say that at Keswick, Kendal, and other places in Cumberland and Westmoreland, more rain falls than in Wharfdale."

We received too late for notice in our present number, Mr. Abraham's rejoinder, from which we design to make some extracts on a future occasion.

Remarks on the disputed North-Western Boundary of New Brunswick, bordering on the United States of North America. By Captain P. Yule, Royal Engineers. London: Ridgways, 1838.

This is a pamphlet designed to attract public attention to a subject on which the author laments over public indifference and ignorance: his very title indeed conveys a tacit satire on popular ignorance respecting even the geography of our American colonies. He gives a very clear but concise account of the matters in dispute, and the various treaties and conventions on which they depend; the whole illustrated by a map marking very plainly the different lines of boundary proposed by different parties. A matter of this kind does not ordinarily fall within our province as journalists; though as Englishmen we feel an interest in the question, and as men we hope the disputing parties will find a rational and satisfactory settlement of the debate by peaceful argument alone. It happens however that even as journalists we are interested in this particular debate; for not only is the disputed territory important in relation to the integrity of our North American possessions, but we remember to have heard that a magnificent plan for a great Railway is necessarily postponed till this dispute be settled. The proposed line is designed to connect Quebec with one of the harbours of the Bay of Fundy; thus offering to the Canadian capital a harbour always accessible, and dispensing with the tedious and uncertain navigation of the St. Lawrence. Americans and English are foremost in the honourable race of mechanical improvements; they compare their railways with mutual advantage; they have of late mutually rejoiced in the success of the experiment which has brought their shores practically closer together: we firmly trust this difference, already of too long standing, will be speedily adjusted. And then we will give them at their own door a specimen of English railways,—willing alike to teach and learn.

Transactions of the Society for the encouragement of Arts, Manufactures, and Commerce: Vol. LI., part II. London: 1838.

This second part of the Society's transactions, contains as usual several interesting papers on various branches of Science and the Arts. There are however some of them more immediately connected with the objects of our Journal; and to these we shall confine our remarks.

But first we must be allowed to make a few remarks respecting the management of the Society itself. The mode of publishing the proceedings, we consider decidedly objectionable. On the present plan, none of the papers which have gained for their contributors the thanks of the Society, nor of the inventions rewarded by them, during the session of the present year, will be known to the public for from twelve to eighteen months to come. These, we conceive, should be announced forthwith; it would bring the Society more constantly before the public, and create a greater interest respecting their objects, were they, like other societies, to publish monthly brief abstracts of their papers. There must, we fear, be something radically wrong in the conduct of the Society, when we find further, that an income of 1,026*l.* is as stated in the accounts of the past year entirely expended in the support of the establishment, and that of this sum only a paltry 161*l.* has been distributed in rewards and prizes. For so praiseworthy an object, the Society ought to have a surplus of two or three thousands;—and we feel convinced that such would be the case, if they could but be induced to get rid of some of their antiquated modes of proceeding, and modify their plans so as to adapt them to the existing wants of the public. The designs of the Society are of the utmost public importance; much has been done by their means formerly in creating and diffusing a taste for the fine arts, and stimulating the progress of mechanical and manufacturing improvement; and we are fully convinced that much may still be done if the members will but resolutely exert themselves for the renovation of the Society.

We have however digressed somewhat (we hope not unpardonably) from the object of our review. To return then to the part of the Society's transactions at present before us. The paper on "Limestone and calcareous cements," by Mr. Aikin the respected Secretary of the Society, is deserving of an attentive perusal by the profession.

There is also a valuable practical paper, describing a "Method of building an obelisk without scaffolding," by Mr. T. Slacks of Lang-

holm, which is well deserving of notice. This paper and that of Mr. Aikin before mentioned, we shall notice again hereafter.

Mr. Wicksteed, the chairman of the Committee of Mechanics, has contributed a useful practical paper on the use of "Wooden wedges for water-pipes." This paper will attract attention to a mode of securing the joints of pipes, at present very little known, though it has been adopted for upwards of fifty years with complete success. To such of our readers as have not seen the Transactions of the Society, we cannot do a better service, than to give this paper in full.

The Thanks of the Society were voted to THOMAS WICKSTEED, *Engineer to the East London Water-Works, for his experiments on the application of Wooden Wedges to secure the Joints of Water-Pipes.*

Old Ford, July 14th, 1837.

SIR,—As the Society of Arts propose to publish my paper upon the method adopted by the East London Water-Works Company in making the joints of their water-pipes, I beg leave to add, that, although I consider it the best and most economical mode of making joints where pipes are laid *straight*, nevertheless (as it occasionally happens that in laying pipes, either to save bend-pipes where the curve is very slight, or by deviating from the straight line to avoid some sewer, or other obstruction, we are obliged to lay them so that the spigot end of the pipe does not enter the socket in a straight line) it is sometimes necessary to have recourse to an inferior material for the joint, as, for instance, lead, or iron cement. As, however, such cases happen but rarely—probably not one joint in a hundred—it will not be any objection to the adoption of wooden joints. I consider lead inferior to wood, because it is less elastic, and it is, therefore, more liable to be blown out than a wood joint, which, on account of its elasticity, has a firmer hold on the joint. And to iron cement, besides its want of elasticity, there are two objections; one, that it requires time to set before it can be safely exposed to a pressure; and secondly, if there should be a defect in the joint it must be made afresh, as it can neither be spiled as a wooden joint, nor set up as a lead joint.

There may be objections to a wooden joint in some cases, but in the majority of cases, if proper attention be paid to the quality of the wood, the form of the wedges, and care taken in making it, it is decidedly the best.

I am, Sir, &c. &c.

A. Aikin, Esq., Secretary, &c. &c. THOMAS WICKSTEED.

Old Ford, January 4, 1837.

SIR,—Having, for the last seven years, made use of wooden wedges, instead of lead, or iron cement, for the purpose of making the joints of our water-pipes, and considering that the great success attendant upon the renewal of this old method of making joints is worthy of being noticed, I propose to give you some account of it, that the Society of Arts may, if thought worthy of notice, make it more generally known.

Soon after I was appointed engineer to the East London Water-Works Company, Mr. Grout, one of the Directors of the Company, called my attention to the use of wooden wedge joints, stating, that joints had been so made at the Norwich Water-Works, for more than forty years, and had been found superior in stability to, and far less expensive than, lead or iron cement joints. I made some inquiries about them; and, amongst others, received information from an engineer at Newcastle-upon-Tyne, that they had been used in the collieries in that neighbourhood for above half a century. After considering the subject, I recommended the adoption of this method of making joints, although in opposition to the opinions of other professional gentlemen: the result has proved most satisfactory.

After having made use of the joints constantly for five years, I stated to some other engineers the result of my experience, and was answered by their saying,—that although there was no doubt that for *low* pressures—say, equal to 100 or 120 feet column of water—the wooden joints would answer; nevertheless, when exposed to a *greater* pressure of water—say, of 200 or 300 feet—the wedges would be blown out: I therefore tried the joints under a great pressure, and reported the result to the East London Water Works Directors, in January 1835, from which report the following is an extract:—

"I have, at various times, heard objections made to the wooden wedge joints adopted by the East London Water-Works Company, because it has been said, that the joints, under any extraordinary pressure, would be blown out; now as this, if correct, would have been a serious defect in the principle, I have thought it advisable to try what pressure they *would* stand.

"I caused two 3-inch, two 5-inch, and two 18-inch joints to be made, and placing the pipes, jointed, in the proving-machine at Old Ford, gradually increased the pressure, until it equalled a column of water of 733 feet* in height, without the joints being affected; when being perfectly satisfied with the result, I did not further increase the pressure, being fearful that the apparatus would break before I could blow out the joints; and I have no doubt that the pipes would have burst before the joint was destroyed.

"The only other objection that I have ever heard made to the wooden joints, has been a suspicion of their want of durability. In opposition, however, to this surmise, there is not only this principle, viz., that when wood is protected from the action of air and water (as is the case with the wood joint in that portion of it forming the wedge), it will not decay; but also the evidence produced by one of the directors, of the durability of wood joints at Norwich, and evidence which I myself received from Newcastle, and other places, of wood joints that had been made for fifty years, and were then perfectly sound.

"The joints that have been made for the last five years in the East London district are all good, and, in no instance, where care has been taken in making the joints, have they leaked.

"Before concluding this report I wish to observe, that the pressure to which the pipes were exposed in making the experiment was so much greater than that to which pipes are usually exposed, that it would, perhaps, be well to record the weight and thickness.

		Cwt.	qrs.	lbs.
"The 18-inch pipe was barely $\frac{3}{4}$ in thickness of metal, and weighed		11	0	0
The 5-inch	$\frac{1}{2}$	2	0	14
The 3 inch	$\frac{3}{8}$	1	0	14

"These pipes were exposed to a pressure of 733 feet column of water without bursting."

The following is a statement of the quantity of pipes I have laid for the East London Water-Works Company, the joints of which have been made with wooden wedges; and I have only to remark, that the repairs necessary have been very much less than those required upon lead or cement joints.

Bore.		Length.
3 inch	diameter	10,882 yards.
4	ditto	14,964
5	ditto	2,738
6	ditto	4,065
7	ditto	730
8	ditto	140
9	ditto	2,645
12	ditto	111
15	ditto	11
18	ditto	2,272
	Total	38,558 yards, or $21\frac{8}{10}$ miles.

The following Table will show the expense of joints, for one mile in length, of iron pipes of various bores, made of wood, iron cement, and lead:—

I. Bore of Pipes.	II. Cost of *Wood* Joints, for one mile in length, of various bores, as shown in column I.			III. Cost of *Iron Cement* Joints, for one mile in length, of various bores, as shown in column I.			IV. Cost of *Lead* Joints for one mile in length, of various bores, as shown in column I.		
inch.	£.	s.	d.	£.	s.	d.	£.	s.	d.
18	60	10	$8\frac{1}{4}$	135	14	$10\frac{1}{2}$	221	6	$11\frac{1}{2}$
17	56	5	1	128	8	$1\frac{1}{2}$	207	5	$8\frac{1}{4}$
16	54	8	$4\frac{1}{4}$	122	5	10	192	12	$2\frac{1}{4}$
15	51	7	3	115	11	$3\frac{3}{4}$	179	15	$4\frac{1}{2}$
14	48	18	4	108	16	$9\frac{1}{2}$	165	1	$10\frac{1}{2}$
13	45	17	$2\frac{1}{4}$	101	10	$0\frac{1}{2}$	158	7	$4\frac{1}{4}$
12	42	16	$0\frac{1}{2}$	75	16	5	120	9	$1\frac{1}{2}$
11	39	2	8	67	5	$2\frac{1}{2}$	101	10	$0\frac{1}{2}$
10	36	13	9	62	7	$4\frac{1}{2}$	94	3	$3\frac{1}{2}$
9	33	0	$4\frac{1}{2}$	56	5	1	86	4	$3\frac{3}{4}$
8	30	11	$5\frac{1}{2}$	48	18	4	76	8	$7\frac{3}{4}$
7	26	18	1	47	1	$7\frac{3}{4}$	67	5	$2\frac{1}{2}$
6	23	4	$8\frac{1}{2}$	38	10	$5\frac{1}{4}$	57	9	$6\frac{1}{2}$
5	21	8	$0\frac{1}{4}$	33	0	$4\frac{1}{2}$	49	10	$6\frac{1}{4}$
4	18	19	$1\frac{1}{4}$	26	5	$10\frac{1}{4}$	40	7	$1\frac{1}{2}$
3	16	10	$2\frac{1}{4}$	22	0	3	34	4	10
	606	11	4	1189	17	$11\frac{1}{2}$	1852	2	$1\frac{3}{4}$

From the foregoing table, it appears that the joints, for 16 miles of iron piping, varying from 18 inches to 3 inches, will cost, if made of wood, 606*l*. 11*s*. 4*d*.; if made of iron cement, 1,189*l*. 17*s*. $11\frac{1}{2}$*d*.; and if made of lead (20*s*. per cwt.), 1,852*l*. 2*s*. $1\frac{3}{4}$*d*., exhibiting a considerable saving in expense in the use of wood.

The material to be used for wooden joints should be the best Dantzic fir. A balk is cut up into chocks of 9 inches in length each. These chocks, having been riven with an axe into pieces $\frac{3}{4}$ inch thick by about two wide, are worked into the proper form by spoke-shaves curved to suit the inside of the socket, and outside of the pipe for which the wedge joint is required. Each 9-inch piece of wood, when worked and cut in half, makes two wedges, each $4\frac{1}{2}$ inches long.

Herewith you will receive a chock of fir, a piece riven ready to be worked into the proper form, one when worked, two wedges made out of one piece, and two spiles; also, a curved spoke-shave or drawing knife, and a set.

The joints are formed thus:—The wedges are introduced into the socket, and placed close to one another—each forms an arc of a circle, and is wedge-shaped; a set is then applied to the end of the wedge, and the workman strikes it with a hammer, driving the wedges in regularly and gradually all round (as a cooper hoops his barrels) until they are driven up tight; the ends, if any are left, are cut off with a hand-saw, so as to leave the joints flush. When as many joints are made as are required so as to allow time, before the day's work is completed, to fill up the trench and cover the pipes, a bonnet is strapped on to the end of the newly laid line of pipes, the water is admitted to the other end, and the joints exposed to the pressure of the water in the mains; a man then examines every joint carefully, and wherever there is an escape of water, he makes an incision with a chisel, and drives in a wooden spile, which immediately stops the leak. When the whole of the joints have been thus examined and made tight, the ground is filled in, and the work is completed.

* Equal to the enormous pressure of 318 lb. on the square inch!—ED.

From this description it will be seen that it is necessary to have some communication with pipes already charged with water, which is always attainable in established works. In new works it will be necessary to have a force-pump, or other means to prove the joints before the ground is filled in.

In lead joints the operation is,

1st. To introduce some gasket which is driven in tight all round, to prevent the melted lead from running into the pipe.

2nd. To melt the lead. A man and fire are required in this case, but not so in making wooden joints: hence a saving in materials and labour.

3rd. To form a clay mould.

4th. To run the lead in.

5th. To set up the joint.

With the foregoing description and tables, aided by the specimens referred to, and a specimen of one of the joints when made (of which specimens I beg the Society's acceptance), I trust the advantage, in many, if not most, cases, of this description of joint will be perceived.

I am, Sir, &c.,

A. Aikin, Esq. THOMAS WICKSTEED.

Fig. 1.

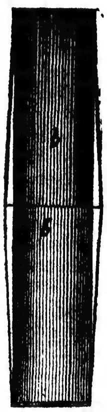


Fig. 2.

Fig. 3.

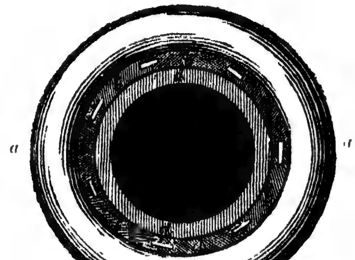
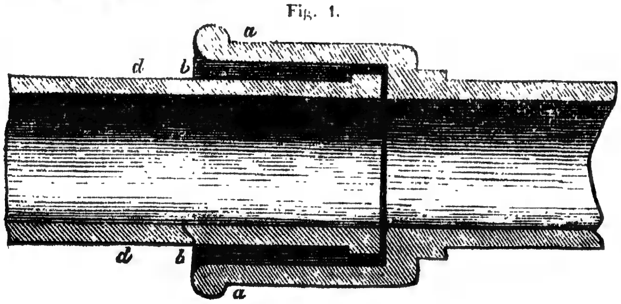


Fig. 4.



Reference to the Figures.

Figs. 1 and 2, a vertical and side view of a pair of wedges, which is separated into two by sawing across in the direction of the transverse line.

Fig. 3, a plan of the joint by which two pipes are connected. *a a* the socket of one pipe; *d d* the spigot end of the entering pipe; *b b* the wedges, tightened by spiles.

Fig. 4, a section of a joint.

Index to the Times, for May 1838. London: James Wyld.

For fulness of information on all possible subjects, the Times has long held a high and well-earned reputation: for statistical facts especially, its file is constantly consulted by men of all parties and of all occupations. An index like the present is much wanted, to diminish the labour of reference; it is full, well arranged, clearly printed and cheap. Every one will look to his own particular topic of interest to judge of the merit of the work: and we looking to the head of "Railways," find the news of the month on this subject most clearly drawn out and referred to. Under the head of London and Birmingham for instance, we find the completion of the front; various complaints about the mode of carrying on the traffic, which have appeared in the Times during the month (with what justice, is nothing to our present purpose); and the conveyance of the mails. We find numerous foreign railways noticed in various stages, from the debating whether they shall be made, to their final opening. So also, English legal intelligence in great variety; and the progress and working of numerous railways at home.

We view this index as a specimen: and from its execution, and its evident utility, we cordially wish the publisher the success which his spirited undertaking so justly deserves.

ORIGINAL PAPERS AND COMMUNICATIONS.

RALPH REDIVIVUS—No. 7.

THE POST OFFICE.

Let us just step across the way,—I mean cross over from Goldsmiths' Hall to the Post Office,—a moderately short cut, especially when it is considered that it carries, to the antipodes, Sir Robert Smirke's Grecian being diametrically opposite in taste to Mr. Hardwick's Italian. "Cross over," is, perhaps, an ominous expression, for it almost seems to say that I am going to be cross myself; it shall therefore be "let us go round" and look at the façade. There is no occasion for us to take our station so as to behold at the same time the north end of the building, because there is no particularly classical gusto in that; on the contrary, it partakes more of a Quaker's drab bonnet than of Athene's helmet.

Having fairly passed that corner; we may now pause to contemplate the front. According to Wightwick, whose opinion ought to stand for something, "there is a severe tone of classic propriety about it which almost awes criticism into silence. Smirke has here emulated the true nobility of Athens and has 'done the deed' of which an Ictinus might be proud." That the portico is a noble feature, that it is executed upon a grander scale than almost any other, that it displays itself to very great advantage, and that all the rest is kept quite subservient to it, are points I do not intend to dispute. Neither can exception be taken to the general composition; which must be allowed to have an air of dignified simplicity arising from continuity, regularity, breadth of masses, and magnitude. Still as far as design alone goes, I am unable to discern anything more than sober discretion, and correctly calculating taste, without aught that gives evidence of either superior mind or any imagination and invention on the part of the architect himself. If he shows himself correct, it is because he is exact, and adheres as rigorously as it is possible to do to the express forms and features of the antique, carefully abstaining from introducing besides more than circumstances absolutely compel him to do.

Oddly as it may sound to those who hastily adopt current opinions, it is possible for a building to possess much merit, though the architect himself may not possess at all greater talent than those whose works exhibit greater incorrectness and more inequalities; nay, very probably, he may not happen to be gifted with so much. The secret of this is, that as far as circumstances will allow, he confines himself steadily to some approved pattern, without venturing, if he can possibly help it, to introduce a single idea that can be mistaken for his own. What is the consequence?—this abstemious cautiousness, which more likely than not ought to be ascribed to sluggishness of imagination, procures for him the reputation of being exquisitely classical and chaste, although in any other art a similar system of copying would procure for him who adopted it, the unenviable sobriquet of Sir Facsimile Plagiary.

It is rather inexplicable, why so much stress should be laid upon scrupulous fidelity to extant classical authorities, precisely in that very art where fidelity may be accomplished by unerring mechanical rules, without demanding that species of skill which is necessary for producing a faithful copy of a fine original in painting or sculpture. Not only do we most barefacedly copy the individual and component parts, as far as ancient examples will supply any applicable to our purposes; but we make no scruple of taking them by wholesale, without studying how to give them any degree of newness by combining them differently. We do not employ them as words, which are common property in a language, in order to express our own ideas; but take ideas and all, repeat the very expressions, and thereby reduce architectural composition to the level of a mere happy knack in quotation.

Were no merit whatever arrogated, such a system would be less offensive; but when we find so much pretension go hand and hand with the most undisguised practice of purloining ready made-up materials, we may be excused—not for being magniloquently indignant at it,—but for smiling at the excessive simplicity of the public who lifting up their hands with to-be-wondered-at wonderment exclaim what conceptions! what genius! has Sir Facsimile. Surely it would be but decent were those architects who show themselves to be no more than compilers to abate a little of their claim to the title of artist. In the republic of letters—whose motto may be "Fraternity" but certainly not "Equality,"—the dictionary-maker does not pretend to place himself on the same form with the poet,—nor for the matter of that, even with the puniest novelist—I might say not even with the puniest punster, though as far as serviceableness goes he may be worth more than poet, novelist, and punster, all three together. In architecture on the contrary, men actually pique themselves on doing that which however it may show their taste, most assuredly does not

display any talent on their part. To say the truth, design is thus reduced to what any amateur who is master of his pencil, can accomplish equally well,—in proof of which, we might refer to the idea published some years ago by Mr. Kelsall, alias Mela Britannicus, for rebuilding Windsor Palace in the Grecian style.

On the first introduction of the genuine Athenian and Hellenic architecture among us, it was no more than desirable as well as natural that we should conform strictly to the various examples of its orders: yet that is no reason wherefore we should continue to do so, now that we are well acquainted with them, repeating over and over again precisely the same forms, to the exclusion both of variety and individual character. Either we have been studying them all the while to no purpose; or we ought by this time to have sufficiently imbued ourselves with the spirit of the originals, to be able to preserve it without servilely transcribing the very patterns themselves, and to communicate it to what is conceived with artist-like freedom. So then! I recommend it seems that we should abandon those models, and give ourselves up entirely to our own fancies! Very far from it; I recommend no such thing; all I protest against is the mechanical and unartistical practice of invariably giving fac-similes of them, or rather of one or two individual examples;—a practice the reverse of that pursued by the Greeks themselves, as is proved by the numerous varieties we meet with in their treatment of the same order. That some of them are much inferior to the others cannot be denied; but then this very circumstance itself is favourable to *us*, because it affords scope for the exercise of our own taste and invention, leaving to us the task of working up those less perfect specimens into more finished consistency and gracefulness. Besides, after all, what avails it to be so punctiliously and superstitiously exact in such particulars, when we do not scruple to take wholesale licenses in matters of far greater importance, as influencing general effect and character? I am therefore inclined to suspect that such scrupulous reverence for the antique is frequently no better than a pretext to cloke either indolence or something worse. Be that as it may, it is a pity that their reverence for the antique does not lead our architects to avail themselves of some of the capitals deposited in the British Museum. They are it is true but fragments; yet on that very account are they calculated to prove more valuable as studies, because while they show enough to serve as a theme, they leave it to the artist to expand the idea, and supply all the rest from his own resources.

By this time the reader perhaps smells out much strange heresy in my doctrine, which may, therefore, be impugned by the stalest arguments *ex adverso*. I do not however apologise for the above remarks, on any other ground than that of their being, although greatly too brief to serve as a full exposition of the matter itself, somewhat too lengthy for the present occasion, having detained me from commenting on what is professedly the subject of my present paper. Yet the building itself is of such negative quality,—with so little either of excellence or the contrary which can be attributed to its author, that it does not afford much opportunity for particular criticism. In itself it possesses, most unquestionably, the advantage of extent; and is commanding from its style, no less than from its size: and had it been erected a century earlier than it was, it would have been entitled to very high praise indeed, as manifesting a singularly pure and correct taste in comparison with what then prevailed. But at this time of day, when we have got the Greek grammar of architecture quite by heart, and know all its rules by rote, there is very little merit in applying them with tolerable correctness, where there is no ambition to achieve anything more.

We are told of Addison that his natural talents "were so restrained and disabled by his constant and superstitious study of the old classics, that he was in fact but a very ordinary poet." *Mutatis mutandis*, this will apply to the architect of the Post-office. Whatever imagination he may have of his own, he represses it so entirely, out of deference to his classic models, that he does not permit it even to betray any symptoms of its existence. So far from being ambitious of signalizing himself, he is content to act entirely as proxy for the ancients, doing nothing—as far as he can avoid it—for which he has not their immediate sanction. It is therefore an invariable practice with him to confine his attention exclusively to the order and the columnar parts; bestowing no other study on the rest, than how to render them as little conspicuous as possible, so as not to divert attention from what is principal in the design. Unfortunately however this tends to produce a result contrary to the one aimed at; inasmuch as the disparity of character between the several parts of the composition, becomes in consequence all the more striking. The only novelty observable here is that the upper face alone of the architrave is continued along the parts between the centre and ends of the front.

In regard to the portico itself it is unexceptionable; it comes in, as a portico invariably ought to do, where it seems absolutely required to fill up the design, instead of being placed so as to look like an extraneous addition to the parts behind it. It is remarkable also for its spaciousness; for besides being brought out boldly forward, it likewise retires nearly as much within the building, and thus acquires more powerful depth of shade; added to which it looks in consequence more inseparably connected with and belonging to the rest of the edifice, than does one that merely juts out from it. The large door is a noble feature in itself, and loses nothing from being contrasted with the two smaller ones. Yet while I readily admit that every thing here is good, I cannot help also fancying that it might by a little more study have been rendered very much better: for instance, had what are now separate pedestals below the columns been made a continued stylobate, leaving only the present entrances at the extremities of the front of the portico, it would I conceive have been a decided improvement; more especially had such stylobate been continued beyond the extreme pedestals, but brought forward upon the same line as, and in lieu of, the present palisading, which so far from being in any degree ornamental, is altogether the reverse, detracting very materially from the general appearance of the architecture, whereas a solid podium or low screen wall would have given not only a classical but a somewhat unusual character to the whole.

As to the Hall, I do not consider it by any means to be compared with the portico itself; so far from being pure in its style, it presents most offensive discrepancies. The east end, with its small arched doors and windows, is of a character quite inconsistent with that of the other; nor do those features appear to have been introduced with any other design than to make them agree with the windows of the same kind in the back front. Yet if there was no other alternative, it would have been better to sacrifice unity of style in a part of the exterior which makes little pretension to architectural display, than within the Hall itself; more particularly as the petty and objectionable features complained of, interfere with the effect of the portico itself, being distinctly seen through the great doorway. I might also observe that the sides of the Hall are little better than its east end; having a very ordinary, cold, and unfinished appearance in comparison with the columns. However, as I have now said in the way of praise all that my critical conscience will allow me to do; and in the way of censure enough, perhaps, to make others fancy I have no conscience at all, I will only add, *Basta!*

ON BUILDING MATERIALS.

NO. III.—CEMENT.

Although cement and lime are frequently employed in the same manner, nevertheless as the distinction between them is well known to the practical builder, I have thought it best to treat of them under separate heads, and shall confine myself in the present essay to a description of those substances which are most commonly employed in the external decoration or covering of buildings.

The practice of coating the exterior of buildings with some kind of artificial cement, in order to render it more durable or more beautiful to the eye, is undoubtedly of high antiquity: the temple of Jupiter Olympius at Agrigentum in Sicily, is erected of a loose coarse sandstone, and covered externally with a fine white substance, almost as hard and durable as marble; in the ruins of the city of Alexandria in Egypt, are the remains of some edifices coated with a cement which to this day is almost impenetrable to the chisel; and the remains of ancient Rome present many proofs of a similar practice.

In England cement appears to have been little used until the commencement of the present century, when Messrs. Parker and Wyatt patented the article commonly called Roman cement; which for many years was extensively used throughout the kingdom, although it is now partially superseded by the introduction of other substances. This cement varies much both in quality and price, but is never so good as when it was first introduced; it might then be used even during a sharp frost, but now few builders would venture to apply it at such a season. Whether this inferiority arises from the nature of the material itself, or from the mode in which it is manufactured, I am not able to determine; but certain it is that its quality has greatly degenerated within the last fifteen years. This cement is manufactured principally from stone found in the Isle of Sheppy: its colour is very dark, so that it requires frequently colouring, and it is very liable to crack in drying. It is best mixed with an equal portion of sand by measure, although sometimes two parts of sand to one of cement is preferable; the cement must however be then of the very best quality. Although a fine and almost impalpable powder, it is generally coarse when wet; and except when mixed with great care, can seldom be made to bear a very smooth face. Only a small portion of this cement ought to be mixed at a time, as it sets quickly and is of but little use

afterwards. Its principal value consists in its power of resisting the action of water, to which it is almost impervious very soon after it is applied; hence it is much used in coating the upper surface of brick arches, and lining cisterns and damp walls in basements of buildings. It does not however possess the power of resisting fire in the same degree, as a very moderate heat entirely destroys its tenacity: it is somewhat remarkable that this circumstance is frequently but little known to bricklayers; and I have several times seen ovens, coppers, furnaces, &c., set with it, and although I have warned the workmen of the certain consequence of its employment in such situations, my cautions have been treated with contempt, until experience has proved their correctness.

Atkinson's cement is very similar in quality to Roman cement, but is much better in colour: it does not however set so expeditiously, and it absorbs moisture more; in good dry situations, when used for ornamental work, it is certainly preferable; but for building purposes it is, I think, inferior.

Almost every kind of stone lime, if well burnt and used immediately, becomes a very durable cement; the oxygen of which it is deprived by the action of the fire is gradually re-absorbed by exposure to the atmosphere, and hence it in time becomes almost as hard as the stone from which it was originally manufactured. Of stone lime however, the blue lias is almost the only kind which is extensively employed in coating buildings, &c. When used as stucco, this lime is certainly superior to Roman cement; it is not so liable to crack or blister, and being similar in colour to stone, it does not require to be coloured. For the first coat it should, after being carefully screened, be mixed with about three parts of coarse sharp sand; and for the finishing, with two parts of fine sand to one of lime.

Hamelin's patent mastic is above all others the most durable and excellent substance for ornamenting buildings. This material is mixed with oil instead of water: it is very difficult to lay on properly, and requires considerable care and experience in order to make it attach itself firmly to the walls &c. The thinner the coating, the better; it should never exceed one-fourth of an inch;—ignorance of this fact has sometimes led to very disagreeable results. I was once shown the house of a gentleman which had been covered with mastic at a great expense, and from the walls of which it had fallen off in large patches, some above a yard square; this was principally owing to its thickness, it being in many places near an inch and a half thick. The Monument on North Down in the Isle of Thanet had its mouldings formed of mastic worked out solid; and in a very short time they nearly all fell off.

In London where mastic has of late been extensively used, a much better method is adopted; it is there usual to lay it on the walls in as thin a coat as possible, and all mouldings and other projections are first formed of Roman cement roughly, and then covered with mastic about one-eighth of an inch thick. When used in this manner, and the surface of the wall &c. previously properly prepared, mastic will become almost as durable as stone, and will last for ages. It is likewise capable of bearing the heat of the sun for a long time without cracking, and when carefully worked has a surface almost as smoth as polished marble: and should it require painting it can be done very soon after it is put on.

Various kinds of cement have been introduced at different periods to supersede the use of lead in covering flat roofs; of these none has hitherto been effectual, as they are all liable to crack and let in the water. In Persia, a cement for this purpose is formed of sand and a species of molasses, which resists the action of an almost vertical sun; and in Asia Minor, I am told that the flat roofs of the buildings are commonly covered with a layer of reeds, over which is spread a coating of cow dung and pounded sea shells, which in time becomes almost as hard as stone. The introduction of Asphaltum into this country will probably give a fresh impulse to attempts of this kind; although its inflammable nature is a great objection to its extensive use. As this substance is quite new to us, I shall refrain from giving an opinion upon it until practical experience shall have enabled us to judge more correctly of its merits.

C. L. O.

ON THE CLAIMS OF CIVIL ENGINEERING TO BE CONSIDERED AS A PROFESSION OF GENIUS.

By Hyde Clarke, Esq., C.E.

If there be anything which can be justly esteemed an object of rational pride, it is the contemplation of great works of public utility; which, whether they be erected by our ancestors or ourselves, are equally productive of pleasure and enjoyment. It is in such monuments that we appreciate the triumph of science over all other objects of competition. The greatest victory of the hero is but the precursor of his nation's downfall; the songs of the bard fall tuneless on the ears of those to whom the language is unknown; and the temples of the architect crumble into ruin, with the oblivion of the name to which they were consecrated: but the exertions of the engineer continue for ages to minister to the wants of successive generations, who although they may forget their constructors, will ever appreciate the utility of their labours. The site of Troy lives but in the pages of Homer; the eternal city is now the tomb of the same desolation which it once scattered abroad; but the roads of the Romans are as crowded as ever, and will live longer than the memory of their founders.

The engineer thus labours in the composition of works more durable than those of any class of artists; and he may be truly said to work for immortality, who labours not for this generation or this age, but for all posterity. The designs of the painter after many resuscitations fade for ever; the finest marbles of the sculptor perish, or their subject becomes forgotten; the ruined piles of the architect are torn from their position to construct new buildings; but the causeway of the Roman is the path of the Lombard and the Italian; while aqueducts for nearly twenty centuries have supplied to the Goth, the Moor, and the Spaniard, water from the fount from which the Romans drank.

As the compositions of the engineer are of this imperishable nature, so have they been appreciated by every people, as true sources of national grandeur and prosperity. The pyramids of Egypt were its least glory; gigantic canals transported to India the traffic of the world, or diffused plenty and abundance over the whole country. Among the Greeks, the triumphs of Alexander as an engineer were not less than his victories in the field; he built out the sea to join Tyre to the continent, and his efforts at Alexandria rendered that city long the emporium of Eastern commerce. With the Romans, the spade which dug entrenchments in time of war, gave strength to the country on the return of peace; nor were their exertions confined to Italy, but even to this day in Spain, France, and England, you still see unimpaired many of their roads, bridges, and aqueducts. In modern times this emulation in useful enterprises has not ceased; and the greatest men of all countries have vied with each other in the magnitude of their designs. One of the glories of Louis Quatorze, is the Canal of Languedoc; and the Emperor Napoleon conquered those Alps by magnificent roads, which he had previously surpassed by his incomparable genius. Peter the Great and the daring Catherine, Frederick of Prussia and the Emperor Joceph, all strove equally in the vastness of their civil works, as in the extent of their conquests.

How is it in this country and in America? It is felt that the people have imperishable treasures, in the works executed by their own energy or the prudence of their ancestors. It would be in vain that the powers of steam armed the manufacturer with magic facility of production, unless his textures were distributed to every part of the country by adequate communications, or conveyed to distant lands from the docks and basins of the coast. These glorious productions we may esteem as living monuments of our greatness. The writings of our poets may be read in foreign lands, the designs of our artists spread over the world by engravings; but the Caledonian Canal, Plymouth Breakwater, the Menai Bridge, or the Birmingham Railway, to be appreciated must be seen. It shows a purity and exaltation of taste, in which we are lamentably deficient, that while our nobility, gentry, and men of learning travel but to view works of taste or to dissipate time; it is always the principal object of foreign visitors and often their sole inducement, to see those transcendant testimonials of our engineering skill that are better known on the Continent than the brawls of our statesmen, the victories of our heroes, or the effusions of our writers.

Having shown the importance of this class of monuments, it is essential to estimate the merit that is due to their designer for his exertions in their production; and to consider how far the execution of these works is a matter of acquired skill, and how far of native genius. It is undeniable that the practice of Civil Engineering requires a high class of scientific attainments, many years of study, and a well instructed experience; but we should do wrong were we to imagine that the qualifications for the profession are confined to these requisites. Engineering is of all professions, the military excepted, that in which a new adaptation of expedients to unforeseen occurrences is ever most imperatively required; and in which a mere knowledge of past efforts will be insufficient, unless the mind be competent to invent new processes, as well as to avail itself in the best manner of old ones. No man can go upon a spot, and say I will do such and such things at such an expense; some unexpected variation of nature beneath the surface will often thwart the best calculated plans, and render all attempts at economy abortive: happy if the difficulties be surmounted, and the work be completed. It is genius only, and genius of the highest kind, which can properly preside over the just application of the fixed rules of science to the ever occurring variations which spring up in the course of an engi-

neering undertaking. What other power could have combated the circumstances which retarded the progress of the Thames Tunnel, and impeded the excavations on the Birmingham Railway?

Nor is this quality of genius confined to the execution of works, but it must be present at their suggestion. Any man can draw lines from one town to another, or survey the localities; but it requires an exquisite exertion of thought, properly to design a canal or a railway. Men of the greatest talent and experience will repeatedly fail in the formation of a harbour, and find all the resources of science fruitless and unavailing; because the circumstances of the case require new modifications of preceding theories, which they may prove incapable of suggesting. Who can go over a great public work without seeing the marks of some presiding genius imprinted at every stage, and without feeling his admiration excited by the contemplation of every new object? In the enthusiasm of the moment the name of the engineer may be asked;—but it is too often to be considered as an extravagantly paid mechanic, or a competent superintendent over excavators and bricklayers;—while the man who paints a portrait of some illustrious unknown, or erects a plagiarised building, is esteemed as having more genius, and as exercising a more liberal profession. This is not just: and a due appreciation of the circumstances would point out that the success of a great work is not dependent on parrot-like acquaintance with science, or mere mechanical skill; but that to the greatest acquirements must be united a degree of genius which can supply the deficiencies of the precepts of the art, and point out new tracks where none have passed before.

Discoveries and new applications in science and medicine have covered their promoters with honour, and their country with glory; but in civil engineering where more triumphs of this kind have been achieved than in any other branch, they are passed over in silence and neglect. Jenner was rewarded for introducing vaccination, Watt is crowned with praise for his improvements on the steam-engine, and the fame of Captain Cook is established on an immoveable basis; but few think of the claims of those who introduced or improved railways, locomotive engines, and suspension bridges. The last traveller who has advanced an inch nearer to the Pole, is considered worthy of higher honours than those who have given to all generations immortal testimonies of their own genius, and their country's greatness. Every new work adds some farther improvement to the science; and notwithstanding the heavy responsibility which weighs upon engineers, the boldest experiments are being continually made at the hazard of their own fame, with small chance of reward, and often with a lowering prospect of doubtful success. The bold attempts on the Thames Tunnel, and the Great Western Railway, are noble efforts of the enterprise of the engineers, and of the public spirit of their countrymen. The author may suppress an unworthy composition, the artist may discontinue an unsuccessful work, and the philosopher may renew experiments which he is praised for having attempted; but the plan of the engineer once commenced, to pause is to be disgraced, and to commit an irreparable error, is ruin in the eyes of the world and of all posterity. Young men who are entering the profession may feel assured that unless they have a natural genius for it, they will fail, even should they acquire the most extensive mechanical and scientific attainments; and they will as certainly turn out plodding surveyors or mere clerks of the works, as one who enters on some other career without proper taste will become a scribbler or a dauber, a briefless barrister, or an unfeed physician. They must remember that this is a profession which has to combat the difficulties of streams, tides and currents; to work under the surface of the ground, to soar over the valley, and to pierce the hidden recesses of the mountain; to stem the sea with a bridge, and to erect buttresses against the tempest.

The claims of the profession to be received as one of genius being thus established, it remains to be considered what title it possesses to rank with others; and in this it will be necessary to refer to the circumstances which have previously influenced it. Among the Romans and other ancient nations, engineering was always executed by the military, and it was esteemed a glory in even the greatest commanders to preside over works to which their names were often attached. This union of the two professions was carried down to the lowest ranks; and the common soldier carried his weapons and his spade, just as the commander alternately directed a distant campaign, or an important work. Even down to our own times, some degree of connexion has always been maintained, and in the English and most other services the Artillery and Engineer departments are often employed on public works; while in Sweden in time of peace the whole army is occupied as the Romans were of old in constructing canals, bridges, and docks. In Holland and France, civil engineering forms a distinct government department; but the effect of this arrangement is to produce exactly the result of a University or an Academy,—to send forth abundance of men of instruction, but few men of genius. The profession however enjoys a high rank, and its services are properly appreciated.

In England down to a late date, the profession has existed by isolated but brilliant names, and has been little appreciated. The great impulse given by the construction of canals and railroads has increased the number of its professors, and established them as a distinct class; but much remains to be done before it can be regarded as placed in its proper rank. The formation of the Institution of Civil Engineers is a happy omen of the success of the profession; as is the foundation of classes for its study in the Universities of Durham, and London. A most important result of its progress will be to subdivide into branches, and by such subdivision of labour to improve each respective department; already the civil and practical engineers are separated, and a distinct classification for harbours, railroads and bridges will certainly promote an equally beneficial result.

In conclusion,—the successful progress of Civil Engineering is important not only to the commercial and manufacturing interests of the country, but to its perpetual welfare; and as this century is already distinguished by some of the noblest efforts of this science, so it is to be hoped that the new reign may leave to future generations many such memorials of the national grandeur, and undeniable testimonies of that true glory which seeks public utility rather than empty fame.

THE PARKS AND METROPOLITAN IMPROVEMENTS.

In our last, we gave a general review of these most valuable ventilators to our great city; and we would now say a few words on the buildings that adorn them, but that we do not feel at liberty to assume the critic on the works of *living* artists, nor wish to thrust our hands into a hornet's nest. We shall therefore only congratulate the public that in the greater part of the late erections, the principles of *Grecian* art have been followed, and its capabilities asserted, whether in adorning the less extended area of a Park Lodge or the more expanded volume of a colossal building.

But before we proceed to our subject we must advert to a criticism which has elsewhere appeared, upon our remark upon the improper use of bronze or any valuable metal for public monuments. As contradicting our position, the bronze horses over the porch of St. Mark's Venice, the equestrian statue of Marcus Aurelius at the Capitol, and the Balbus of the museum at Naples are quoted. But these three instances out of three thousand, or more probably thirty thousand, are the exceptions that confirm the rule. The Venetian horses were the pillage of Greece; to whose honour they were originally formed, is entirely unknown. They ornamented successively different triumphal arches at Rome; were transported by Constantine to his new city, and conveyed thence by the Venetians when they took and plundered Constantinople in 1206. They were removed to Paris in 1797, and restored to Venice in 1816. Whether they have finished their travels, is in the womb of time; but they do not now, nor do they ever appear to have supplied, since their removal from Greece, any memorial of their original creation.

The Marcus Aurelius was accidentally preserved, and as accidentally found in forming the area around the church of St. John Lateran; Vasi describes it "as the ONLY equestrian statue that remains of all that embellished ancient Rome." The Balbus was preserved by the same eruption that consecrated the ancient cities of Pompeii and Herculaneum to modern research.

Statues however, of such colossal dimensions as could scarcely be accidentally buried; the Apollo, which Pliny describes in the palace of the Cæsars on the Palatine, fifty feet in height; that of Nero, the work of Zenodorus, one hundred and twenty feet high; were no doubt re-cast for domestic purposes, and are probably now in the British Museum under the useful forms of jugs, saucepans, and other necessary utensils;—forming no unapt parallel to Hamlet's reflection tracing the "noble dust of Alexander stopping a beer barrel." We think we need not further enforce this argument; but the consideration of the question has led us to a new reading of the often quoted barbarism of Mummius the Roman Consul, on the taking of Corinth B.C. 147. Had the ignorance of that conqueror equalled all that has been said of him, still he would surely have learned the value the Corinthians placed upon many of their statues, which he was transporting from their city by the right of conquest, (although himself entirely unequal to their appreciation as works of art), and have estimated them accordingly. They are reported to have amounted in number to several thousands: from the known celebrity of the Corinthians for casting in metal, they may be supposed to have been chiefly of bronze; and as the greater part were probably not better than

some that have lately been set up in our own capital, Mummius having ascertained their WEIGHT (with an eye to prize-money) gave notice to the Commissariat who had the charge of the booty for the general benefit of the army, that if there was any deficiency, they were the responsible officers to make it good. But as the object in erecting monuments in public places, is to carry down to a distant posterity the expression of a nation's gratitude to its benefactors, let us for a moment consider how far this has been accomplished by the employment of bronze. In our own capital the statue of Charles I. remained on its pedestal about twenty years, and was preserved from total destruction, only by the same cupidity that had ordered its sale. In Paris the statue of Henry IV. occupied its position for nearly one hundred years (a brief immortality), ere it was fated to circulate under the useful but somewhat degrading form of pieces of two sous, having exchanged the stamp of royalty for the emblems of revolutionary France. We have no precise date of the duration of *antique* bronze statues: we only know that they have all disappeared, and may conjecture that they have followed, what may be termed the law of nature.

Let us now turn our attention to other materials—stone or marble. In our capital we have but little sculpture placed externally; but as even one small specimen is fully enough for our purpose, we will refer to the alto relievo on the base of the monumental column erected by Sir Christopher Wren in the City. It is now, after a lapse of one hundred years, although placed in the most moist and the most smoky part of the town, as perfect though not quite so clean, as when left by the sculptor; no feature has suffered either from mutilation or decay.

But although London affords us but this solitary example, how amply are we supplied by the ecclesiastical buildings of our episcopal cities! Many of these already boast an immortality of six or seven hundred years; and though the fury of the iconoclast has in some instances damaged what was within his reach, yet as no other feeling than religious enthusiasm directed him, they have escaped with only degrees of injury. As regards our own posterity then, for the next ten generations, we may safely reckon upon stone: and if we refer to other climes we are lost in the long perspective. Suffice it to say, that the Greek marbles in the British Museum speak the same language to us, that they did to the Greeks themselves three thousand years ago; and that while no one statue of bronze has reached our times, those of marble, although exposed for so many centuries to all the varieties of the seasons, have with but trifling injury been preserved for our instruction. From all example therefore we feel the truth of the assertion we now repeat, "*that all monuments intended to convey to posterity the gratitude of man to his benefactors, should be formed of a valueless material.*"

We have now to make, what will at first appear to be a somewhat *startling* digression; but we are warranted in offering our remarks by no less an authority than Vitruvius, who (l. 1. Introduction) says, speaking of the necessary qualifications of the architect; "Skill in physics enables him to ascertain the salubrity of different tracts of country, and to determine the variations of climates; for the *air* and *water* of different situations being matters of the highest importance, *no building will be healthy without attention to these points.*" The subject to which we allude and which has created great alarm for the health of our beloved Queen, is the report that Typhus fever is prevalent in the New Palace; and with such efficient cause as we shall point out, in full operation, no one will for a moment doubt that such effects *may* be produced.

The experience of the whole reign of his Majesty George III. will attest the salubrity of the spot, even before the recent and complete drainage of that part of the town, now occupied by the Belgrave Square district, and which as the "Five Fields Chelsea" was during seven or eight months of the year, little better than a morass. The Grandfather of her present Majesty resided here with his numerous and healthy family; and some cause must have effected an evil, which the change we have alluded to above, must have made even more remote. That cause may probably be found in the very extended surface of stagnant water lately introduced *on each side* of the palace; the miasma of which, inferior in *quantity* only to the malaria of the Pontine marshes, must be ever penetrating into the apartments. Whether the wind be from the East or the West (the most prevalent winds of our climate), there is no escape for the pestilential vapour, which blown directly against the palace, must insinuate itself into it and therein deposit all its noxious qualities.

But were these circumstances insufficient to convert a healthy into an unhealthy spot, there is yet a hidden but no less operative cause. At the top of Constitution hill, and near the entrance archway, concealed from public view by the low shrubbery around it, is the reservoir formed by Mr. Nash for the purpose of supplying the fountains he intended to place, but which were not executed, in the Royal Gardens. It is now neglected and probably forgotten. It is we imagine about one hundred feet in diameter; we do not know its depth, but at the time we saw it (the morning of June 8th), it was filled to within about five feet of the curb; covered with a thick coating of green animalculæ, except where the even surface was broken by the bodies of eight dead dogs; a vertical sun was acting in its full power on the putrid mass. We admit that this reads very unpleasantly and very unlike the description of the gardens of Adonis, but it is impossible to describe such things "en couleur de rose."

To remedy these evils (and the remedy may be effected during the absence of the Court for the autumn), it is only necessary to bring back the ground to the state, as far as the elements of land and water are concerned, in which it was at the time to which we have referred, namely, to draw off ENTIRELY the shallow and pestilential lake in the Palace gardens; the small depth to which any part of it is dug will give only a variety to the surface of the ground, and an opportunity for judicious planting: and to fill up the Western half of the ornamental water in the St. James's Park enclosure, and the useless reservoir on Constitution Hill. These cheap and efficient remedies will secure the health of the inhabitants, and relieve the public from the charge of erecting another palace, which will assuredly be forced upon them by the necessity of the case, should the symptoms we have quoted from several public journals, and which we imagine may be but too true, continue. May they thus avoid

"Whatever plagues
Rise from the putrid watry element,
Motionless and rank."—*Armstrong.*

To resume our more immediate subject. We have expressed our unwillingness to criticise the works of *living* artists; but we do not feel, that that principle prevents our remarking upon designs to which no professional name is attached, and we therefore assume the privilege of treating them as public property.

Nothing can exceed our regret that such should be the case:—that a building so noble in its purpose and so prominent in its position, as the new chapel for the Wellington Barracks, should not have had upon it the impress of the talent of a Smirke, a Barry, or a Cockerill. That its design has not proceeded from any of those gentlemen, the proof is afforded by the flagrant violation of some of the most fixed principles of the order in which it is erected; and for which departure from antique models we have no means of fixing a responsibility.

That upon a building upon which Pericles would have employed Ictinus or Callicrates, our modern Pericles should have thought fit to consider only the most economical method of obtaining professional assistance, and have disregarded or undervalued that fragment of Himerius which says, "so great was the effect of the Parthenon in the eyes of Greece, that its construction alone might have sufficed for the glory of Pericles;"—must be a source of great regret so long as the building shall exist, and we shall not shrink from stating wherein we think our observations are borne out.

The principal or West end has a portico of four Doric columns; but its author has most ingeniously contrived to create a difficulty to himself, where the most limited acquaintance with ancient authorities would have taught him to adopt a beauty. Instead of keeping the line of his flanks unbroken, and finishing the walls with antæ, he has reduced the width of his portico about two feet on each side, preventing thereby the use of those characteristic terminations, and almost forcing upon himself the necessity of employing clumsy pilasters,—features never used by the Greeks,—in order to appear to carry the return of his entablature. To this unnecessary deviation from right for the purpose of doing wrong, he has added the hardihood of omitting the mutules over the metopes; thereby destroying that continuity of form, so eminently desirable; and which may not unaptly be likened to drawing each alternate tooth from the mouth of a beauty. But if the entrance front thus displays either an ignorance or a vanity of alteration so inimical to the effect of the building, how much greater a departure from all rule do the flanks exhibit. That maxim of the Greeks, (even more religiously observed by the Romans),—that the metopes should be a square, or so nearly so that the eye cannot perceive a deviation from that figure,—is entirely departed from, and the frieze exhibits the extraordinary appearance of metopes of three varied sizes on the same line. The author had here only to preserve the straight line of wall and to perforate it for windows; but this simplicity was beyond him, and he has again recurred to the unknown pilaster, at once destructive of all character and subversive of all rule.

We have before said that the details of the design are convincing proofs that it has not proceeded from any high professional character: and our zeal for the profession carries us somewhat further; namely, to the very reasonable inquiry, why the defects of some later professors should be employed as a pretext for depriving the profession of the rank of Surveyor General, formerly held by Sir William Chambers

with so much credit to himself and so much benefit to the public. It may be conceded, that the situation, from the examples to which we have alluded, might have required some control over its expenditure; but that the rank which gave the head of the profession the power of direct communication with the Sovereign, should have been lost, must be felt in every grade of it, and should stimulate all its members to its recovery. If the architectural members of the Royal Academy, the Architectural Society and the Institute of British Architects, do not endeavour to accomplish this object;—if they do not set forth the claims of the profession to a more prominent situation than that of occasional consulting counsel, when the difficulty appears too great for the office clerks;—they may as well dissolve their associations. They may flatter themselves, that they are encouraging good taste, they may hope they are aiding the education of men who may do their country honour, but they will find they are exerting themselves to no good purpose, so long as their care is nullified by the employ of of irresponsible or incompetent parties.

We are fully convinced too, that by these deviations from established forms, an unnecessary expense has been incurred, which would have paid the commission of an educated and intelligent architect, and saved at the same time the character and the purse of his employers. The deviations may appear trifling to the unprofessional reader, and the circumstance of the building answering its purpose be triumphantly asserted; but we beg to explain our position by analogy with the art of poetry, which our highly born and highly educated ministers *will* appreciate. Would they tolerate a false quantity in a Greek or Latin hexameter line,—or consider as sufficient the excuse, that it conveyed the sense of the passage,—or would they admit him to the rank of a poet—

> "Who free from rhyme or reason, rule or check,
> Breaks Priscian's head and Pegasus's neck."—*Pope*.

We now again ascend the steps at the foot of the York column, and pass, on the principle we have before mentioned, the buildings that surround us. Turning our eye Eastward, we are caught by the view of the National Gallery; and in the same direction, we observe the spire of St. Martin's Church, rising above the mass of houses that have been recently built: and our regrets must find utterance, that in the first consideration of the improvements in this quarter it was not made a peremptory command, that the fine portico of that church should have terminated the vista of Pall Mall. This principle neglected, all else has been confusion and compromise.

We ought however, as in much else in our mundane state, to rejoice that we have escaped so well; and as we consider that a criticism on the National Gallery will be no departure from our principle, we are induced to give that building our next consideration. We consider it no departure from our principle; because Mr. Wilkins is understood to have retired from the practical exercise of his profession, and his fame is therefore public property. That fame will require no blazon from us; the integrity, taste, and science which he has brought into his professional practice are evinced in so many ways and always so much to his honour, that we look to his long enjoyment of his retreat with equal hope and pleasure.

For we are far from being of the number who venture unmeaning and undefined censure on the National Gallery, and we are sure that even the errors which those people decry, are not attributable to the professor. Among the most prominent is the want of height. But the cavillers should be aware that two very sufficient causes prevented a greater altitude;—namely, limited funds, and the necessity imposed on the architect to employ the old columns from Carlton House. To use these without effect, Mr. Wilkins has placed them on a high basement and contrived to convert the want of space in his front into a great beauty;—we mean the approach by the side stairs, which create a picturesque effect from the groups passing up and down, (and particularly on the side view,) which no other arrangement could effect; and we always regret that the Royal Academy, apparently for the purpose of coaxing a few shillings on a wet day, should have disfigured their side of the building with a permanent covering. Having obtained this base, the architect had to place thereon his vagrant columns; and this circumstance added to the desire of not swelling his pecuniary charge beyond the wishes of the government, decided the height now condemned.

We shall return to this question after saying a few words on the other objection; the too numerous breakings of the front. Here again that irresponsible interference must bear the blame. It is well known that the columns on the side entrances formed no part of the original design, but were added on a suggestion that could not be disputed, in the idea of masking what they have served (besides their other demerits) only to make more remarkable, and to effect which, eight new columns were made to match the old ones.

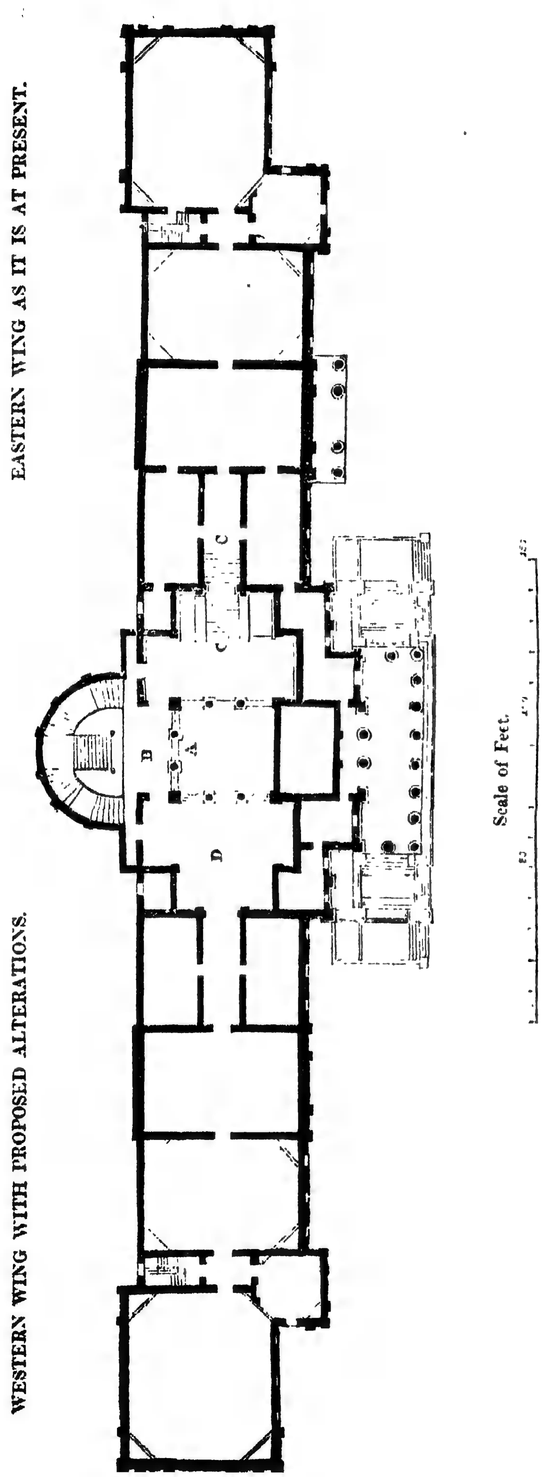
In order that we may dismiss this portion of our subject while the elevation is under consideration, we will venture to call to the mind's eye what it would have been without this interference, and with a small addition to the contemplated expenditure. Of these alterations the most effective would be the removal of the side columns. If the abstraction be desirable as giving repose to the front when seen from the south, how much more effectual will it be, for the improvement of the building, when seen from Pall Mall or Duncannon-street! From those points the numerous angles and breaks are truly distressing. This alteration would create but a very trifling expense, and the government would still be in possession of eight columns wherewith to task the ingenuity of some future state-architect. On the removal of the open ballustrade and the formation of a solid and somewhat more lofty attic, and the addition of a range of columns round the drum of the dome, a small expense might be incurred; but with these additions and subtractions, which we fully believe the architect contemplated, we do not hesitate to say that the building will be equally the admiration of the present day and of posterity. We never pass up Whitehall but we rejoice to see how nobly the portico fills the spot, and until we catch a sight of the side columns we are enchanted with the rich simplicity. In this view we know that we are supported by the first non professional opinion of the day on architecture and sculpture.

Our next consideration is the interior arrangement. There we at once combat the senseless cry of "Where is the gallery?" All the world has been to Paris, and all the world has walked through the Louvre; and therefore our National Gallery is to be assimilated to that very inconvenient expectation. No doubt they are somewhat led astray by the term "gallery;" although with us that term has lately been applied to every collection of art, and as in the instances of the Stafford, the Grosvenor, the late receptacle for the National, and other collections, has nothing to do with the dimensions or shape of the apartment in which they are exhibited;—the word "gallery" in that sense describing a collection of art. We know no rooms where the pictures are better seen, where by the cross divisions more *quiet* is secured to the parties who are enjoying the contemplation of them: and our only regret is, that in the wish to cover as much wall as possible or for some other cause, pictures by modern artists have been admitted, the merit of which by no means establishes the right to such positions.

With these observations on a disappointment which many of the journals have loudly stated, we proceed to the general arrangement; to the task of pointing out wherein the difficulty of the architect has been increased by the discordant office to which the building is appropriated; and we shall then propose a remedy and exhibit a plan which we have well considered and therefore fearlessly recommend. The building is equally divided between the National collection of pictures, and the Royal Academy. To obtain for the latter a place of exhibition for sculpture, it was necessary to form a room on a lower floor and easily accessible from the street. This, the architect has effected, but to the great detriment of his principal entrance; which is dark, and the approach to the principal floor indirect. And not only was his purpose of making his stairs a prominent and visible object, immediately on entering the building, foiled by this necessity; it has created another and not less serious evil, namely the narrow passage which encloses the stairs leading to the principal rooms. These are the only objections that force themselves upon us, and we think they belong not to the professor, but to the instructions he was bound to carry out.

It may be as well here to inquire whether by the arrangements which have thus tended to mar the National Gallery, the Royal Academy has obtained what it wanted in space for the purposes of its institution; and if on a candid inquiry it shall appear that the art has gained nothing by the change, while the public has been a great loser, we hope the plan we shall propose for satisfying all parties, will be entertained with the same good feeling with which it is proposed. It will be admitted that there could be no more cogent reason for moving the Royal Academy from Somerset House, than the desire to procure more accommodation for the student: the institution being, not a sinecure for the professors, but a *Royal Academy of the Fine Arts*. It is not however generally known, although it cannot be too earnestly considered, that the academical year may be stated to commence on the 1st of October; that the schools are open during the dull and cloudy season of the year, when in the day time there is little light, and in the evening the severity of the weather often prevents attendance, and close *in the first week of April until the end of July*. They are again open for the month of August, and close on the 1st of September. By this analysis it will be seen, that during all the time the student could emply himself beneficially, he is turned adrift for the purposes of the annual exhibition; and that he is

PLAN OF THE PRINCIPAL FLOOR OF THE NATIONAL GALLERY.



at full liberty to attend, when it is most likely he cannot see what he is about. The party therefore whose interests ought to have been consulted has been neglected; nor does any other party appear to have proportionally gained. We have therefore to propose *another move*; and we should not do so, had we not the opportunity of introducing the establishment to a locality in every respect more eligible. It is understood that Burlington House in Piccadilly might be purchased; and we would most respectfully recommend to the government to make that valuable purchase, of a freehold which would long since have been sacrificed to the interests of speculating builders, had not the noble owners retained the high sentiments of the cultivated mind that originally erected it. In possession of this space, galleries might be erected on the North at a very moderate cost, sufficient for the annual exhibition; and the students might thus be accommodated *all the year round*. The government would likewise obtain space for locating under the same roof and its wings, the Royal, Antiquarian, Astronomical, and other scientific societies, which now occupy apartments in Somerset House; and thereby be enabled to accommodate the business offices of the State in that central situation. Our neighbours would designate the new locality as "Hotel des Arts et Sciences;" we should feel that the arts and sciences could not be more appropriately placed than in Burlington House.

Having performed our promise of placing the Royal Academy more advantageously, we have now only to deal with the exhibition of the National Collection of Pictures; and to the better understanding of the mode in which we would propose to do this, we refer to the plan, one half of which exhibits the Eastern wing as it is at present, and the other the Western wing with the alterations we propose. The circular projection, now forming the exhibition room for sculpture, we would occupy by the staircase giving access to each wing. The middle wall at A, is replaced by columns, as on the sides; a flood of light is thereby introduced into the centre saloon, and the approach to the upper floor made immediate and evident. Besides the architectural effect which would result from these alterations, the great test of good design—fitness—would thereby be obtained, by the removal of the great inconvenience, consequent upon retaining the present stairs, — (should the building form one establishment) — namely that of passing down one set of stairs to mount another. The gallery of communication B would remedy this; and the staircases C C being removed, the whole area of the room D would be added to the uses of the building. The central saloon would as at present occupy two stories in height, and the vista of the whole length of the building on the principal floor be preserved.

Gradually covering the walls with specimens of ancient or modern art, as such examples should be acquired after a most critical examination of their merits;—and admitting none, as our continental neighbours have undoubtedly done in some instances, merely to cover the walls;—we should be long so employed ere more space were required, And that space is readily obtainable at any time by an encroachment, or the entire appropriation of the barrack yard in the rear;—a resource which no doubt the government had in view when they made so noble an appropriation of the ground to its present exalted purposes.

We might fairly presume that we should then attain that excellence in art, which alone has served to keep alive the remembrance of nations; but we are thereby to accomplish a more valuable object, for "the great use of the arts, is to humanize, refine and purify enjoyment, and to connect the perception of physical beauty with moral excellence."—*Addison*. J. H.

DESIGNS FOR POOR-HOUSES.

The various Boards of Guardians of the Poor in Devon and Cornwall, are constantly advertising to "architects" for designs for poor-houses; and although none of those gentlemen who would be recognised *as* "architects" by the British Institute ever think of answering them, there is no lack of unemployed masons and *designing* builders in readiness to send in plans. We understand however that the "cheap and nasty" system is bringing a return of due ridicule upon the sapient mismanagers of the yet unfinished buildings; and that the regular architects who were scouted as unnecessary for the preparation of fitting plans and specifications, are being busily employed in putting to rights the blunders of those who have been most unwisely and unjustly allowed to "push them from their stools." A. B.

American Oven.—A new domestic oven, of American invention, was lately exhibited to us. It is somewhat similar in form and construction to the well-known Bachelor's Oven, and is used in exactly the same way. The chief difference between the two consists in the present one being square, while the Bachelor's oven is nearly triangular; and in the former having the tray or pan for holding the meat considerably elevated, that the heat may enter below. The great advantage of this is, that it always allows the rays of heat collected upon the surface of the white iron, to be reflected upon the meat, above and below; thus rendering the invention one of the readiest means of dispatch in the way of cooking which a family can possess. It is so simple, so useful, and so cheap, that it only requires to be known, to be in as common demand here as in America, where we believe it is in general use.—*Scotsman*.

ON HYDRAULIC AND COMMON MORTARS. BY GENERAL TREUSSART, INSPECTEUR DU GENIE.

[Translated from the French by J. G. Totten, Lieut.-Col. of Eng. and Brevet-Col. United States Army, for the *Franklin Journal.*]

Art. 1.—*On the present state of our knowledge of Lime.**

Lime has been employed from time immemorial. Mixed with sand, or certain other substances, it forms what is called mortar. Although the solidity and durability of masonry depends on the goodness of mortar, still few experiments have been made with lime, and the manner of making mortar has almost always been given up to workmen. It is only within about fifty years that a few scientific men have attended to this important subject. Comparing the mortars of the ancients, and especially of the Romans, with those of modern times, it was perceived that the old mortars were much better than ours; and the means have, consequently, been sought of imitating them. Several constructors have thought they had discovered the secret of making Roman mortars; others, on the contrary, have thought that the Romans had no particular process, but that, of all their constructions, those only which were made of good lime had survived to our day. We shall see that my experiments tend to confirm this latter opinion.

Lime used in building, is obtained by the calcination of calcareous stones, which occur abundantly on the surface of the globe. Marbles, certain building stones, chalk, calcareous alabaster, and shells, are employed in making lime. The effect of calcination is to drive off the water and the carbonic acid, which are combined with the lime. The water and the first portions of carbonic acid pass off easily; but it requires an intense and long continued heat to dispel the remainder of the acid. Lime, as used in constructions, contains, almost always, a considerable quantity of carbonic acid.

When the stone submitted to calcination is white marble, pure lime is obtained, provided the calcination be carried far enough. According to an analysis which I made of white marble, this substance contained, in 100 parts, as follows: lime 64, carbonic acid 33, water 3. Lime obtained by calcination possesses the following properties. It has a great avidity for water, imbibes it from the air, and has its bulk enlarged thereby. If a certain quantity of water be thrown on lime recently calcined, it heats highly, breaks in pieces with noise, and a part of the water is evaporated by the heat produced. The disengaged vapour carries off some particles of lime. Water dissolves about one four-hundredth of its weight of lime, forming what is called lime-water.† Lime is caustic and turns the syrup of violets green; its specific gravity, according to Kirwan, is 2. 3, it attracts carbonic acid from the air, and finally returns to the state of carbonate of lime. To preserve it, it is necessary to keep it in very tight vessels.

Lime was formerly ranked among the alkalis, and it is only lately that the true nature of the substance became known. Davy, the English chemist, succeeded in 1807, in decomposing, by means of Volta's pile, the sulphate, and the carbonate of lime, or more properly *lime* derived from these compounds; obtaining a brilliant substance, having so strong an attraction for oxygen that it absorbs it rapidly from the air, and from water, which it decomposes. The brilliant substance obtained from lime is regarded as a metal, and has received the name of Calcium. Accordingly, lime is only a metallic oxide.

It is rarely that lime derived from white marble is used in the arts; that which is commonly employed, and which is derived from ordinary limestone, almost always contains oxide of iron, and sometimes a certain quantity of sand, alumine, magnesia, oxide of manganese, &c. Some of these substances combine with the lime by calcination; and the lime thus acquires properties which it had not before, and of which I shall speak in the sequel.

If we take lime derived from white marble, or from common lime stone, and reduce it as it comes from the kiln to a paste with water, and if we place this paste in water, or in humid earth, it will remain soft for ever. The same result will be obtained if lime be mixed with common sand, and the resulting mortar be placed in similar situations.

It is a common practice to deluge lime fresh from the kiln, with a large quantity of water, and run it into large basins, where it is allowed to remain in the condition of soft paste. Alberti says (book II., chap. XI.) he has "seen lime in an old ditch that has been abandoned about 500 years, as was conjectured from several manifest indications, which was still so moist, well-tempered, and ripe, that not honey or the marrow of animals could be more so."

There is another kind of lime which possesses a singular property; if it be slaked as it comes from the kiln, as above, and be then placed in the state of paste, in water or in moist earth, it will harden more or less promptly, according to the substances it contains. The same result is obtained if the lime, being mixed with sand, is made into mortar and placed in similar situations. If this lime be slaked and run into vats, as is done with common lime, it will become hard after a little time, and it will then be impossible to make use of it.

On slaking lime, fresh from the kiln, with enough water to reduce it to paste, it is found to augment considerably in bulk; this augmentation is such, that one volume of quick lime will sometimes yield more than three volumes, measured in the condition of thick paste. When lime which has the property of hardening in water is slaked in the same manner, it affords a much smaller volume than common lime. Sometimes one volume of this lime, measured before slaking, will give, when slaked to thick paste, scarcely an equal bulk. For a long time those limes which had the property of hardening in water were called *meagre limes*, and those which had not this property were called *fat limes*. These denominations were affixed because the first kind increased but little in bulk when made into paste, while the other gave a considerable augmentation of volume; and because fat limes formed, with the same quantity of sand, a mortar much fatter or more unctuous than meagre lime. But the designation "*meagre lime*" is altogether improper to indicate limes which enjoy the property of hardening in water, because there are limes which augment their volume very little, on being made into paste, and at the same time possess no hydraulic property. Belidor gave the name of *beton* to lime which had the quality of hardening in water; but many engineers continued to call it *meagre lime*. The denomination of *beton* is not suitable; and, in this sense, is not now in use. The following are the terms now employed.

In England, the name of *aquatic lime* has been given to lime which indurates in water; in Germany it is called *lime for the water*; M. Vicat, engineer of roads and bridges, has proposed the name of *hydraulic lime*, and this denomination, which is a very good one, has been generally adopted. I shall therefore call that lime which swells considerably in slaking, *fat lime*; that which swells but little and does not harden in water, *meagre lime*; and that which possesses the property of hardening in water, *hydraulic lime*. *Fat lime* is often called *common lime*, also. The term *quick lime* is applied to all unslaked limes, whether *fat lime*, *meagre lime*, or *hydraulic lime*. Although *meagre lime* and *hydraulic lime* may have been calcined exactly to the proper degree, still they are slower to slake, and give out less heat than *fat lime*. When *fat lime* has been too much burned, it also becomes slow to slake; while, if properly burned, it begins to slake the instant water is thrown on. Experiments, to be given in the sequel, will show that iron, in the state of red oxide, causes *fat lime* to slake sluggishly.

Some of the ablest chemists have, at different times, sought to detect the substances which impart to lime the property of indurating under water.

Bergman, a Swedish chemist, was, I think, the first who gave an analysis of a hydraulic limestone. That from Léna, in Sweden, he found to contain, in 100 parts, the following substances: lime, 90; oxide of manganese, 6; clay, 4. Bergman seems to have attributed the peculiar property of hydraulic lime, to the oxide of manganese; and this opinion prevailed for a long time. On the other hand we find in the *Bibliothèque Britannique*, of 1776, vol. 3, page 202, that Smeaton the English engineer, who built the Eddystone Lighthouse in 1757, attributed this property to clay; for he says that it is a curious question, which he leaves to chemists and philosophers to decide, why the presence of clay in the tissue of a calcareous stone should give it the property of hardening in water, while clay added to common lime produces no such effects.

Guyton de Morveau, announced in a memoir published in 1809, that he had detected the presence of oxide of maganese in all the limestones which afforded hydraulic limes; he announced further, that in calcining together 90 parts of common limestone pulverized, 4 parts of clay, and 6 parts of black oxide of manganese, an excellent artificial *meagre lime* would be obtained. It was stated above, that at that time the name *meagre lime* was given to lime that would set under water; the French chemist was the first, therefore, to make artificial hydraulic lime; but he, as well as Bergman, was mistaken in supposing that the presence of the oxide of manganese was necessary to the result. He would have obtained his result by burning the pulverized limestone with clay alone.

* The present article is the first of a series on hydraulic and common mortars. In presenting them, the Translator thinks that he is rendering a service to the art of construction in this country.

The French, within a few years, have devoted themselves with great zeal and effect to the subject of mortars; and they have applied, with perfect success, the results of their experimental investigations to actual constructions of great difficulty and importance. The English are, perhaps, equal to the French in knowledge of the best constituents of mortars, and in the practical composition and use of them; but they are not, like their neighbours, in the habit of recording, methodizing, and publishing their experience; and hence, though important information may be very generally spread among their builders of all classes, it is nowhere to be found concentrated in books.

In this country we have been led, within a few years, to some improvements in the practice of mortar making, by the actual necessity imposed by extensive hydraulic works, and by the providential diffusion over our territory of an admirable material; still we are, for the greater part, the slaves of an antiquated routine, elsewhere known to be radically wrong.

The works here translated are recent, and amongst the best issued from the French press: others have been carefully consulted; as Vicat's, Raucourts's, Soleirol's, &c., but these have been preferred as answering best to our need.* To most American readers, they will present many new results, highly important, and of a character to be applied with great advantage to our own operations; they are, therefore, commended to the perusal of all who have an interest in the subject.

In relation to the terms employed in translation, it is proper to state that the expression *fat lime*, used for the *chaux grasses* of the French, is applied to lime nearly or quite pure, not hydraulic, and which swells much in slaking. *Poor lime*, or *meagre lime*, substituted for *chaux maigres*, means a lime which slakes reluctantly, swells but little, and is not hydraulic. *Hydraulic lime*, *chaux hydrauliques*, implies a lime which will harden, in a longer or shorter time, under water: this generally slakes slowly, and swells but little. The French term *ciment* means, almost always, finely pounded bricks or tiles: with us, *cement* is a sort of generic term, having various significations, but generally implying, when used herein, the hydraulic constituent of mortars.

The term *puzzalona* belongs, strictly, to a peculiar volcanic product, formerly much used in hydraulic mortars, and which is particularly referred to herein; it is, however, often used to signify natural substances not volcanic, and even artificial substances, if producing effects similar to those afforded by the real *puzzalona*.

The English having adopted the expressive term *concrete*, to signify the mixture called by the French *beton*, the same term will be used in this translation.

† One four hundredth, Davy—one seven hundred and fifty-eighth, Thompson—one seven hundred and seventy-eighth, at 60 deg. Fahr., Dalton.—Tr.

M. Saussure, in his *Voyage des Alpes*, says that the property possessed by certain limes of hardening in water is due solely to silex and alumine (that is to say, to clay) combined in certain proportions.

M. Vitalis, chemist, of Rouen, made in 1807, the analysis of the limestones of Senonches and St. Catherines, near Rouen; the analysis is contained in the memoir on the schists of Cherbourg (page 58), published in 1807, by M. Gratien, sen., engineer of roads and bridges. This limestone contains, according to M. Vitalis, in 100 parts, the following substances; water, 12; carbonate of lime, 68; alumine, 12; sand, 6; oxide of iron, 2. In addressing these results to M. Gratien, sen., M. Vitalis expresses himself thus:—"It follows from the analysis that the limestones of Senonches and St. Catherines, are two calcareous marles, in which the chalk predominates it is true, but wherein the clay performs an important part. It is this portion of clay which, in my opinion, makes the lime of these two limestones *meagre;* whence it follows, that the presence of oxide of manganese is not indispensable to the constitution of such limes, since the analysis proves that the limestone in question contains no oxide of manganese, as it would, if present, have coloured the glass violet." I noticed above that these hydraulic limes were then called *meagre limes*. We see that the analysis of these stones confirms the opinion of M. Saussure, who had attributed to the clay alone the property of hardening in water. Thompson, an English chemist, was of the same opinion.

M. Descotils, engineer of mines, also made an analysis of the limestone of Senonches; which analysis may be found in the "Journal des Mines," of 1813, page 308. According to this trial, the Senonches limestone contains a quarter part of silex, disseminated in very fine particles, and only so small a quantity of iron and alumine, that these substances can have no influence on the lime; whence this engineer concludes that the hydraulic property of this limestone is owing to the silex. We have, however, seen above, that according to M. Vitalis, it contains twice as much alumine as silex. M. Berthier also inserted in the "Journal des Mines," an analysis of the Senonches limestone, which will be given further on, and according to which the stone contains very little alumine. This contradiction has not yet been explained. Perhaps the quarries at that place afford stones of different kinds. If so, it would be important to ascertain what is the composition of the best.

The analysis of the Senonches limestone afforded M. Descotils occasion to make an important remark on the silex contained in limestone; namely, that the silex found in these stones does not dissolve in acids before calcination, but does dissolve after calcination. This fact proves that the properties of silex are changed by calcination with lime, and that it combines in the dry way with this substance.

M. Vicat, engineer of roads and bridges, published, 1818, a very important memoir on hydraulic mortars. This engineer set out with the opinon generally admitted at that time, that it was the clay which gave to lime the singular property of hardening in water. He, in consequence, took fat lime, which he mixed with various proportions of clay, according to the following process, extracted from page 7. "The operation we are about to describe (says M. Vicat) is a true synthesis, reuniting, in an intimate manner, by the action of fire, the essential principles which are separated from hydraulic lime, by analysis. It consists in allowing the lime, which is to be improved, to fall spontaneously to powder in a dry covered place; afterwards to mix it, by the help of a little water, with a certain quantity of grey or brown clay, or simply with brick earth, and to make balls of this paste, which, after drying, are to be burned to the proper degree.

"Being master of the proportions, we may conceive that the factitious lime may receive any degree of energy desired, equal to, or surpassing at pleasure, the best natural lime.

"Very fat common lime will bear 0.20 of clay to 1.00 of lime; moderately fat lime will have enough clay with 0.15; and 0.10, or even 0.06 of clay will suffice for those limes, which are already somewhat hydraulic. When the proportion is forced to 0.33 or 0.40, the lime does not slake, but it pulverizes easily, and gives, when tempered, a paste which hardens under water very promptly."

Such is the process indicated by M. Vicat. But this engineer did not content himself with experiments on a small scale: a manufactory was established near Paris by his means, where artificial hydraulic lime is made in large quantities; he moreover exerted himself to extend the use of hydraulic mortar everywhere, and he succeeded. He has, therefore, rendered an important service to the art of construction, and I have done him the justice to make this acknowledgment, in the notices I have heretofore published.

In 1818, Dr. John, of Berlin, presented to the Society of Sciences, in Holland, a memoir, which was published in 1819. This memoir, crowned in 1818 by the Society, answered the following question proposed by the Society:—"What is the chemical cause, in virtue whereof stone lime makes generally more solid and durable masonry, than shell lime, and what are the means of improving shell lime in this respect?" Dr. John has remarked, that shells require to be more highly calcined than common limestone: he thinks this owing to the shells being purer carbonate of lime than common limestone, which contains earthy substances, facilitating the disengagement of the carbonic acid. In making the analysis of sundry limestones, he found that those which afforded hydraulic lime contained clay, oxide of iron, &c. He called the foreign matters which gave the property of hardening in water, *cements;* and says, that it is possible, by introducing cement in the dry way, to ameliorate lime which contains none. On these considerations he made the following experiments:—He mixed the powder of oyster-shells, first with $\frac{1}{18}$ of silicious sand; secondly, with several proportions of clay, varying from $\frac{1}{10}$ to $\frac{1}{5}$; thirdly, with $\frac{1}{10}$ of oxide of manganese. He tempered these mixtures by water, formed them into balls, let them dry in the air, and then burned them in a lime-kiln for 95 hours. The following results were obtained: the first mixture was agglutinated, but friable, and was not a good result; the second mixture gave good results; and the third possessed no peculiar property. The author concludes that clay is the ingredient which gives to common lime the property of hardening in water; and he says that nothing can be easier than to procure good hydraulic lime, either from shells or from pure limestone, following the process indicated: he adds, that it is for constructors to determine the best mixture to be made in each case.

The memoir by Dr. John contains the analysis of several ancient mortars, and offers several important observations, of which I shall have occasion to speak.

In the third number of the "Annales des Mines" of 1822, there is a very interesting memoir by M. Berthier, Ingénieur en Chef des Mines; it contains the analysis of different limestones, and several new views, which will contribute to form a more perfect theory of mortars. I shall have more than one occasion to cite his experiments, and his opinion on several important facts.

M. Raucourt, engineer of roads and bridges, published at St. Petersburgh, in 1822, a work wherein he narrates the experiments he made, following the process used by M. Vicat, and adding several of his own. M. Bergère, Chef du Bataillon du Génie, gave an analyis of this work in the "Annales des Mines" of 1824, Vol. IX.

In 1825, M. Hassenfratz published a memoir on mortars. This work, which is voluminous, contains many practical details on the calcination of limestone in different countries, and exhibits the actual state of knowledge in the art of making mortars at the period of publication.

In terminating this reference to works on hydraulic mortars, which have appeared up to this time, I must introduce a fact, entirely new, announced by M. Girard de Caudemberg, engineer of roads and bridges, in a notice published by him in 1827. He states, that the proprietors of mills on the river Isle, in the department of the Gironde, discovered by accident a kind of fossil sand, to which they gave the name of *arène*, which has the singular property, without any preparation, of forming, with fat lime, a mortar that hardens under water, and has great durability. I shall have occasion to return to this important fact, and to report what M. Girard says, as well as to state the principal experiments which have been made with this substance in other places where it has been found.

I was employed, from 1816 to 1825, at Strasburg, at which place they had made no use of hydraulic lime. I ascertained, however, that such lime was to be found in the neighbourhood. Almost all the hydraulic works connected with the fortifications of the place having been badly constructed, and dating as far back as Vauban's time, were to be rebuilt. Twenty-five years' experience had taught me the great superiority of hydraulic mortars in the air as well as in the water—where, indeed, they are indispensable. I tried, therefore, the hydraulic limes afforded by the environs of Strasburg, and found them excellent; they were consequently used in all the works, both in air and water. All the revetments built from Port de Pierre to Port Royal, having a development of about 1,650 yards, were rebuilt or repaired with hydraulic mortar. It was the same with the hydraulic works; they were rebuilt or repaired with the hydraulic lime of the neighbourhood.

An engineer who should use fat lime, even for constructions in the air, when there are hydraulic limes at hand, would be very censurable, because the expense is about the same; and, as regards the strength and durability of masonry, there is a vast difference in favour of the hydraulic mortar. But in countries where no hydraulic lime is to be had, or only that of mediocre quality, what should be done? Shall the engineer adopt the process of M. Vicat, which consists in making an artificial hydraulic lime? I answer, emphatically, that I think not; in this case, occurring very often, it is, in my opinion, preferable to make hydraulic mortar by a more direct process, which I shall point out.

There are two modes of obtaining hydraulic mortar: the first consists in mixing natural or artificial hydraulic lime with sand; the second consists in mixing ordinary fat lime with certain substances, such as puzzalona, trass, certain coal-ashes, and brick-dust or tile-dust. I feel bound to correct here an assertion touching these mortars, not perfectly accurate, of M. Gauthey, Inspector of Roads and Bridges. In his excellent "Treatise on the Construction of Bridges," this engineer says (vol. ii., page 278), that "fat lime is very proper for constructions out of water, but will not answer in the composition of betons to be placed in water, because the mortars in which it is used, even when mixed with puzzalona, and placed in water as soon as made, do not harden, but remain pulverulent." This is far from exact; because mortar composed of fat lime and puzzalona hardens very soon in water, and acquires, in a short time, very great strength. This fact was known to the ancients, for Vitruvius speaks of it, as will be seen further on.

I should not refer to the error into which M. Gauthey has fallen in this instance, if he did not enjoy a reputation so justly elevated. His highly esteemed work being in the hands of every engineer, it was to be feared that this remark of his would prevent constructors from making hydraulic mortars by the direct union of common lime and substances analogous to puzzalona. My experiments will show that, in countries where hydraulic lime is not to be had, instead of following the process of M. Vicat, it is preferable to make hydraulic mortar by a direct mixture of fat lime with substances of a similar nature to puzzalona. These experiments show, also, that fat lime is far from being always proper for construction out of water, although M. Gauthey, in the beginning of the sentence, states it to be.

NEW GATES AND PADDLE AT BRADLEY LOCK ON THE SANKEY CANAL.

JOHN LISTER, ENGINEER.

Fig. 2.—SECTION.

Fig. 1.—ELEVATION.

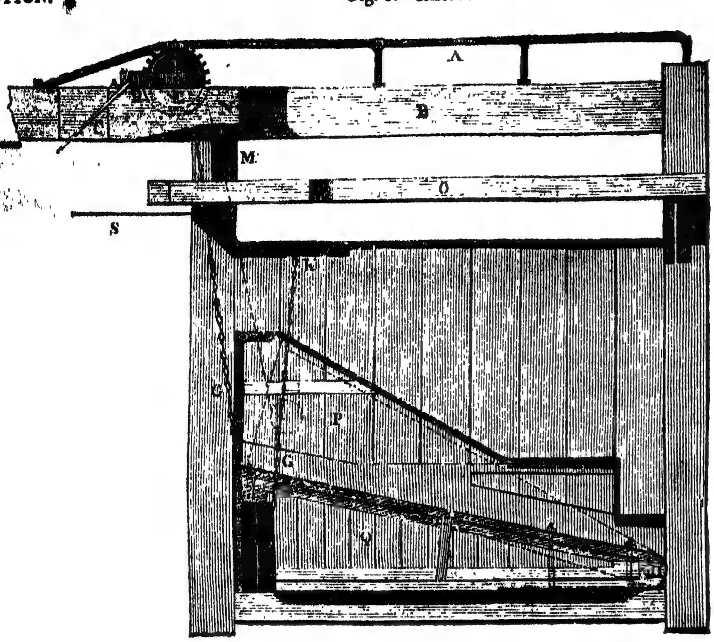
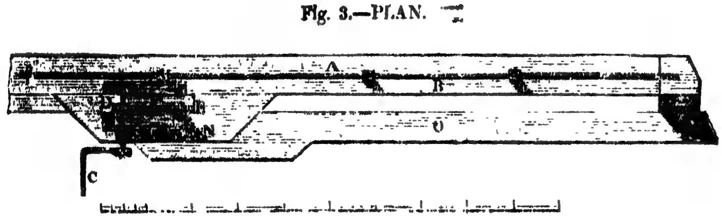


Fig. 3.—PLAN.



0 5 10

Scale of Feet.

REFERENCES.

A—Iron handrail.

B—Sweep of lock gate.

C—Handling: radius 18 in.

D—Driver or pinion; 10 leaves.

E—Wheel; 40 teeth, 16 in. diam.

F—Chain groove; $3\frac{1}{2}$ in. diam.

G—Chain.

H—Box and sheeve attached to the paddle.

I—Axle or centre, on which the paddle acts.

K—Chain, secured to the top bar.

L—Bracket to foot plank.

M—Ditto to gearing frame.

N—Gearing frame.

O—Foot plank.

P—$2\frac{1}{2}$ in. deal planking.

Q—Paddle, or clough.

R—Timber frame-work.

S—Capping to lock pit.

N. B. Similar Letters refer to similar things in the Plan, Elevation and Section.

SIR,—According to your request, I forward for insertion in your Journal drawings and particulars of the new lock gate and paddles mentioned in my letter of Nov. 10th, 1837, on page 44 of your journal. I am sorry I could not forward it sooner.

The paddles have now been in use more than six months; they are no worse for wear, and remain quite water-proof. During the severe frosty weather, they worked admirably well; much better than any others on the canal.

My objects in constructing this paddle were;—to *prevent the flatmen* from wasting water by *flushing*;—to increase the facility of passing flats through the lock, by *filling it sooner*;—and *diminish* the unusual expenditure in repairs;—all of which are fully realized. Besides, the construction and placing of the hand-rail and foot-plank have greatly diminished the danger in passing over the gates, and the rail and paddle gearing are quite out of the way of the ropes and sails, there being nothing for them to become entangled with.

The idea of this paddle first occurred to my mind on the 16th November 1836, while calculating the power of some old paddle gearing; and I committed the particulars to paper on the 22nd of the same month.

Perhaps the following will be acceptable as elucidating the drawings:—

Radius of handling	18	inches.	
Do. of driver or pinion	2	,,	10 teeth or leaves.
Do. of wheel	8	,,	40 teeth.
Do. of chain groove to the centre of the chain	$2\frac{1}{2}$	,,	

And supposing a power of 60 lb. applied to the handling, the effect is as follows:—

$\frac{18\times60}{2} = 540$ lb., effect on the wheel; then $\frac{8\times540}{2.5} = 1728$ lb. effect on the chain: and by passing the chain under the sheeve at H, and suspending it to the top bar of the gate at K, thus converting the sheeve into a moveable pulley, we double the effect, $1728\times2=3456$ lb.,—which is amply sufficient for the purpose; the total resistance to be overcome being about 3000 lb.

I need not repeat what I stated in my former letter, only that the lock fills in 54 seconds; in which time not less than 6740 cubic feet=188 tons, or $46,243\frac{3}{4}$ gallons of water have passed through the paddles. I was informed the other day that several gentlemen (supposed to be engineers) had been to examine the paddles at the old double lock, which are similar to these; but it does not appear that they expressed any opinion. Should I trouble you again with any future communication, I hope it will be something of more importance; in the mean time I would state that I have a scheme for a side paddle (that is, one to fix in the masonry); which I purpose committing to paper soon. It will counteract the resistance of hydraulic pressure, and I expect that the paddle will be capable of being opened by one man, or even one boy, without the application of any mechanical power.

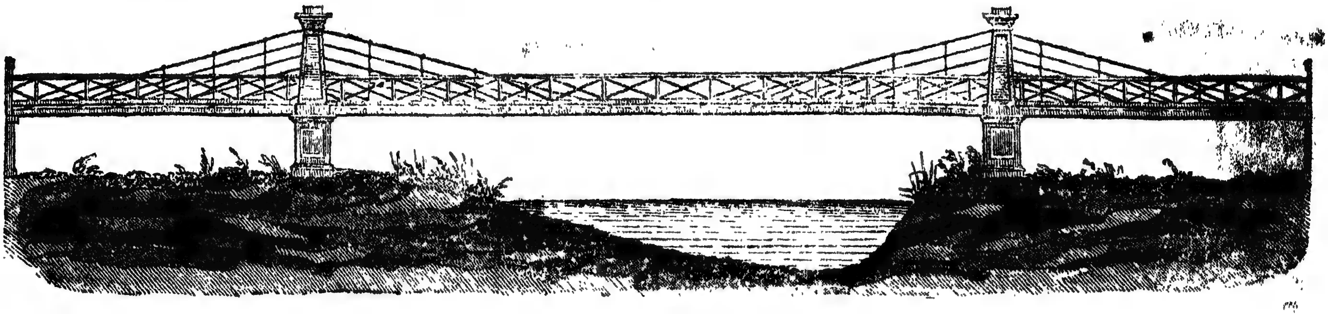
Yours, &c.,

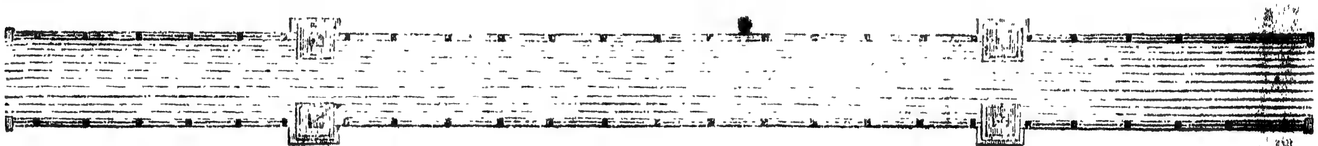
JOHN LISTER.

Engineers' Office, Winwick Quay,
May 23rd, 1838.

TWERTON BRIDGE OVER THE RIVER AVON, NEAR BATH.

ERECTED 1837: THOMAS MOTLEY, ENGINEER.





Scale of Feet.

10 0 50 100 150

THE bridge of which the above is a representation, is erected over the river Avon at Twerton near Bath, and is the first of the kind ever constructed. The span of the middle compartment is 120 ft. from centre to centre of the pyramids; the land ends are about 55 ft. each; making the whole length of the bridge 230 ft. The road-way is 14 ft. wide between the suspending bars.

The four pyramids are placed, each pair on a foundation of concrete 12 ft. by 22; 16 feet thick on one side and 9 feet on the other: the concrete rests on a firm stratum of clay. They are each composed of six courses of Bath stone 2 ft. 6 in. deep, containing two blocks in each course. Their dimensions are, base 5 ft. 6 in. by 4 ft. 6 in.: top, 3 ft. by 2 ft. 6 in. They are covered with a capping as shown in the drawing. At the base of each pyramid, level with the lower part of the beam of the bridge, is a large cast-iron bed, secured by holding-down-bolts inserted into other cast-iron plates in the foundation. In the centre of the large plate is inserted an iron bar 3 in. by 1 in., which passes up the centre of the pyramid to a cast-iron plate at the top, to which it is firmly secured.

The suspending bars are 2 ft. 6 in. apart; and the space between their points of attachment to the bridge, about 9 ft. 3 in. The substance of these bars averages full 2 in. by 1 in.: they are welded in entire lengths, and connected on each side of the pyramid by two bars 3 in. by ½ in., bent in the direction of the strain, and fastened by gibes and keys. On each side of the pyramid is inserted a cast-iron plate from the base to the top suspending bar, cast with holes through which these connecting bars pass.

The beam is composed of two bars of wrought-iron 7 in. by ⅞ in. thick, in lengths of about 18 feet each, properly arranged so as to break the joints, and connected by brace plates. At the edge of each suspending bar which connects with the beam of the bridge, is welded an upright piece of iron about a foot long, of the same substance as the upright supports; and to this the upright supports are attached by coupling joints. In the uprights are proper eyes made, through which the suspending bars pass and are made tight by a wedge above and below the bar, and covered over with a cast-iron rosette. Each suspending bar is attached to a round iron bolt 2 in. diameter, which passes transversely to connect the two ribs or beams. At the land abutment, the rib or beam is secured to cast-iron chairs held down by strong iron bolts, which latter are secured to cast-iron plates inserted in the foundation. The railing on each side of the bridge, is filled in with iron bars placed upright; which are omitted in the drawing to prevent a confusion of lines.

The weight of wrought-iron in the suspending and upright bars, is about 7 tons; the whole weight of wrought iron, including transverse bolts, beams or ribs, foundation plate bolts, railing, &c., about 18 tons: of cast iron about 5 tons.

The floor of the bridge is composed of Memel joists and oak platform. The joists are 12 in. deep and 3½ in. thick: beveled off on the top from the centre to 10 in. The flooring boards are about 9 in. wide, and 2½ in. thick: they are covered with a thick coating of coal tar and sand, on which is laid screened gravel of an average thickness of 3 in., and in a convex form.

The following was the mode of construction adopted. The land ends of the bridge were first erected; the middle portion over the towing path and river was constructed by means of a platform or hanging scaffold suspended horizontally by means of ropes and pulleys from the top of the pyramid. This platform was chained to the iron-work as it was extended out; so that the bridge was carried over the river without any support from beneath.

The foregoing description will, it is presumed be sufficient to enable those who are acquainted practically with iron, to form an idea of the principle on which the bridge is built, and its effect. It may however be observed, that the principle is that of the inverted bracket, converting the force of compression into that of tension, and at the same time preserving as much compression as circumstances will permit. It must be evident even to the most superficial observer, that this mode of construction and arrangement must be less flexible than a chain; and practice has proved that for stability it is unquestionably next to cast iron. Loads of timber of from six to eight tons have passed over this bridge without producing any visible change in the floor; indeed none can be made without either breaking or elongating the bars, except so far as the natural elasticity of wrought iron will allow.

The power of the above bridge may be nearly ascertained by treating it as a lever, which is unquestionably the law by which it is governed. Thus the first suspending bar descends to the bridge at 2 ft. 6 in. from the base of the pyramid, and extends on the floor nearly 10 ft., which is four times the height: consequently one ton at the end would produce a strain of four tons at the pyramid: and so on in like proportion with each of the upper bars. Now there are 24 suspending bars, averaging a section of full 2 in. to each bar, which makes 48 in.: then supposing one inch of best cable iron to support 20 tons, 48 in. would support in a direct or perpendicular strain 960 tons. But the leverage being as four to one, they would only support

a uniform load of 240, the weight of materials included; or on the whole length of the bridge, a uniform load of about 480 tons. Thus if the proportion of material were increased say 50 per cent, it is presumed that this bridge would be amply sufficient for *railway purposes*, even with such ponderous engines as are used on the Great Western Railway.

The cost of the above bridge, including the expense of masonry and very deep foundations, exclusive of embankments and approaches, was under 2,500*l.* Provided only that it be duly painted, it is presumed that the iron-work will endure even for centuries without requiring repairs of any consequence; as may fairly be expected from its comparatively inflexible nature, and the almost entire absence of friction.

EXHIBITION AT THE ROYAL ACADEMY.

ARCHITECTURAL ROOM.

(*Continued from p. 225.*)

By following the order of the numbers in the catalogue, we are doing that which we ourselves complain of as a fault in the exhibition,—namely, jumbling subjects of all sorts *together*, instead of attempting to classify. No matter,—having so begun, so we must now proceed· and therefore start afresh with No. 1088. "Design for an ornamental arch to be erected in a nobleman's park," T. A. D. Monies; where we have the monument of Lysicrates, merely set upon what would otherwise be a very every-day affair. This kind of architectural addition—for combination it can hardly be called,—seldoms fails to produce heterogeneous, centaur-like buildings; nor does the present drawing form an exception. Something good might be made out of such an idea; but it would require some study to unite the two portions ably together, and to give the whole the appearance of having been fused—not con-fused—in the same mind. Besides it amounts to downright plagiarism when we see so considerable a portion transplanted entire.

The three next Nos. 1089–91, consist of elevation, bird's-eye view and section of a design for a National Museum, by W. L. B. Granville. As carefully executed drawings, these are entitled to much praise; and are withal quite of the orthodox Italian school, but at the same time in that fashion of it which is now considered *passé* even by those who wish to recall the style itself. The elevation is composed of two orders, both Corinthian, the lower one in attached columns, the upper in pilasters,—which by the-by, seems to be reversing the natural order of things. The upper floor has niches instead of windows, decorated very much after the manner of those similarly placed in the side elevations of St. Paul's. Each niche moreover is placed within a large arcade, on a ground of rusticated wall, which produces an effect more singular than happy in its novelty. The whole is crowned by a dome with a series of small circular windows just at its base, yet owing to its not being raised on a tholobate, little more than just the upper part of it could be seen from below; and therefore it was, we presume, that in order to show it in perspective the artist made choice of a bird's-eye view; acknowledging thereby in fact, that one chief feature in the geometrical elevation would be nearly lost, were the building to be shown just as it would appear from a moderate distance; and so far, it would be desirable for the dome on the top of the National Gallery to be similarly conditioned. In our eyes the leading fault of this design is that it is in a style hardly any one would think of adopting at present for such a purpose. Nevertheless we perceive by No. 1197, that some one else has selected for the same purpose what with less originality is open to the same objection; for it looks "for all the world like the very moral," as Mrs. Slip-slop says, of the front of Mereworth in Kent.

Being now on the subject of Museums, we may as well dispatch a third, viz., Nos. 1146, and 1166 by R. Penson. Unlike the other two, this is quite Greek, and has a lofty central mass advanced boldly before the wings, and forming an Ionic octastyle in front. In the wings which may be described as consisting of colonnades and extreme pavilions connected by them with the main building, the order is Ionic. Very probably this design was one of those for the Fitzwilliam Museum at Cambridge.

No. 1098, "an attempt at a Polychromic restoration of the Choragic Monument of Lysicrates," C. Vickers; does not attempt to convey any idea of the effect of such decoration; for not being in perspective nor having any background, it does not enable us to judge what would be the appearance of a building thus artificially and floridly coloured, when seen in combination with the objects around it;—though this is precisely the very point in regard to which we are most at a loss.

No. 1102, by C. W. C. Edmonds has much merit both in respect to drawing and design; but the appellation of "Ionic Temple" is rather an unfortunate one, and likely to excite dissatisfaction, the thing itself having far more the air of a casino or other garden building.

No. 1103, "Interior of the Great Hall, forming part of a Gentleman's Residence in Surrey, erecting under the superintendence of B. Ferrey," would be entitled to much praise were it no more than an ably executed architectural portrait. So far this interior loses nothing by its proximity to No. 1066, which we highly commended in our preceding notice,—though not at all more than it deserves; while it is handled with great freedom and mastery, it is free from negligences in regard to architectural forms and details; and has therefore the merit of being correct without any of that hardness, stiffness, and formality, which it is so difficult to avoid without surrendering up something of accuracy likewise. The design itself is a remarkably good application of the Tudor style; and the apartment upon such a scale as to show it off to full advantage, it being a remarkably lofty one with an open timber ceiling or roof.

We now arrive at what will perhaps generally be considered the *lion* of the season in the architectural room,—namely, Mr. Cockerell's "Tribute to the memory of Sir Christopher Wren," No. 1111: which both from its size, and from its being placed immediately opposite the door, catches the eye on first entering. For our own part we should have been better pleased had Mr. C. been a little less modest and claimed our admiration for himself, by vouchsafing to let us behold some ideas of his own—the designs, for instance, of the building he is now employed upon at Cambridge: or for the matter of that, he could have exhibited the last-mentioned subject likewise. Perhaps the reason for his not doing so is, because it would have led to the discovery that great as may be his veneration for Sir Christopher, it does not extend to the complaisance of taking him for a model; and indeed, when the first flush of admiration produced by this showy and alluringly arranged pageant has passed off, and we soberly examine the designs it is made up of, we must say—and it requires some degree of boldness to do so—we are not surprised that Wren's admirers should be exceedingly shy of becoming his imitators. We are of opinion that the same number of any other buildings—no matter what—similarly grouped together, to the exclusion of any thing else, and so as by combination alone to produce an uncommon and picturesque scene to the eye, would answer the purpose just as well; for many of those which help to compose this vision, are any thing but elegant or beautiful in themselves. The whole is like a royal procession, full of glare and bewilderment; yet as all those who figure in the one are not exactly Solomons or Adonises,—on the contrary there are many who upon a less imposing occasion would seem very poor animals,—so here too we perceive some buildings that in themselves are absolutely of the most dowdy quality. We have for instance in the very fore-ground, Temple Bar, flanked on either side by what, if we mistake not, were portions of old St. Paul's School; besides sundry other quaint and grotesque edifices which none save a bigotted admirer of their architect, would now presume to hold up for the general admiration of the rest of the world.

In the small drawing, No. 1116, "Design in the Elizabethan style," H. M. Bostock, there is more cleverness than in many which are far more likely to attract notice. But the next subject, according to the catalogue, "The Royal Institution, Manchester, built by Mr. Barry," is so tremendously vile that, were Charles Barry only half as sensitive and thin skinned as was John Soane of Bœotian memory, he would bring his action for libel against the unlucky wight who has here, through sheer ignorance, caricatured one of his earliest erected buildings, and one of the happiest and most original applications of Grecian architecture that we possess.

Its neighbour, No. 1118, is on the contrary a very good drawing of a very interesting subject, all the more interesting too for belonging to that class of which so very few specimens are exhibited. Not one person in a thousand who are acquainted with the exterior of Fishmongers' Hall, either from the building itself or from prints of it, knows anything whatever of its interior; and few can fail to be captivated by this view of the Banqueting Hall, which shows the whole of that noble apartment from the end adjoining the Court drawing-room, and looking towards the music-gallery, above which is seen the panel of stained glass representing the Company's arms, corresponding with another at the opposite end containing the Royal arms. These transparent panels,—for such is their character rather than that of windows,—are elegant novelties in the design; and the gallery just alluded to is very happily managed so as not at all to interrupt the order,—as is the case in the similar apartment at Goldsmiths' Hall,—but rather so as to give greater energy to it in that situation. One thing that strikes very much in the drawing, but which we do not remember to have at all observed in the room itself, and therefore question whether it has been executed,—is the socle of bright green marble, which contrasting in colour with all the rest, gives such a finish to the bottom of the walls.

Whether it be owing to amiable diffidence or to mauvaise honte, we pretend not to say, but certain it is that architects seldom care to exhibit drawings of the buildings they have erected. Such is not the case, however, with Mr. Vulliamy, who after having sent last year a large elevation of the new front of the Royal Institution, has now sent a perspective view of it (1119) upon the same scale. This drawing cannot be charged with attempting to impose upon the eye by the "painted rhetoric" of showy colours, and artist-like but deceptive effects; for it is only slightly tinted in sepia, and makes no pretension to effect even of light and shade. The design itself is equally flat and insipid, consisting of nothing more than a range of Corinthian columns put up against what neither was originally intended for them, nor has been since adapted to them. The best that can be said of it, is that the front as now altered serves to distinguish the Royal Institution from the other houses in the street.

No. 1128 "Malpas House, Monmouthshire," T. H. Wyatt, has much merit in the design (in the Tudor style) and as a landscape drawing. No. 1130 "Architectural composition exhibiting elevations of the Derby Athenæum and other buildings in progress," R. Wallace, manifests much taste and ability. The style may be said to be a liberal and intelligent version of Greek; adapting it to elevations where windows are indispensable, and columns if introduced used at all, can be only ornamental accessories. The ground floor of the Athenæum has in the centre three triple windows, above which are five windows, with a continued panel of bas-relief over them; and this part of the elevation is terminated by an attic decorated with pilasters without windows, which latter are introduced only in the attic over the extremities. The great

breadth of the piers between the ground floor windows, and the additional openings over them on the upper floor, produce an effect very good in itself as well as unusual; wherein a certain degree of irregularity—namely, the want of exact conformity as to the number of windows on a floor—tends to impart the air of a more studied arrangement to the whole. The two other elevations shown in the same drawing are those of the Royal Hotel, and the Derbyshire and Derby Bank, to the former of which we give the preference.

No. 1138, "Landoge Priory, Monmouthshire, erecting for J. Gough, Esq.," by Wyatt and Brandon, is but of *so-so-ish* design;—a goodly-sized house in that spruce cottage fashion which has been wickedly described as being like "a pigstye just taken out of a bandbox." There is an air both of formality and poverty about it, the reverse of agreeable, inasmuch as each of those qualities is rendered more offensive by its alliance with the other.

(*To be continued.*)

PATENT FIRE-PROOF COMPOSITION.

ATTEMPT TO FIRE AN EXPERIMENTAL FIRE-PROOF HOUSE.

A patent has lately been taken out, for a new fire-proof plaster, for the protection of buildings of various kinds, and of different materials, from fire: and a company is in process of formation with a view to the effectual working of the patent and the general introduction of the new material. Several experiments have been made to test its efficiency; one at White Conduit House in November last; and two others at Messrs. Christy and Co.'s glass works, Stangate, in the month of May. A more public exhibition, to which attention was called by posting-bills, was made on Wednesday the 6th ult., at a dwelling house in Dorset Street, Clapham Road; the proprietors expressing their intention of thus giving a final proof of the indestructibility of their composition by fire. A considerable crowd was collected: and the profession were accommodated by tickets of admission to the enclosure surrounding the house, and to the house itself, both before and after the firing.

The house in question is one of a pair of small six-roomed houses, standing detached and unfurnished: the patentees appear to have found it in carcase, or roofed in and with the joists for the different floors in their places; and to have carried it forward themselves to the state in which it appeared on the day of the experiment. On the ground floor, it contains two rooms, the ceilings of which were formed as usual, only using the fire-proof plaster. With a view also to supporting the weight of the plaster, strips of iron hoop were nailed across diagonally to the joists after the first rough coat had been applied. A floated coat of plaster being added afterwards, and whitewashed, there was no appearance in the ceilings to attract notice. The front door posts were likewise coated with the composition; they were painted, and appeared to take the paint perfectly well; one patch was left uncovered to show the material, which is of a greyish slaty colour, and receives a very smooth surface from the trowel. The face of the bond timbers built into the walls was coated with the plaster, and the walls themselves left bare. In these rooms no floor had been laid down, but the earth was left uncovered.

A substantial timber step ladder led to the first floor; it was coated with the composition, the thickness of which when applied to timber is usually about an eighth or three-sixteenths of an inch. Here the ceilings and walls of the two rooms were prepared as already described. The floors likewise were covered with the composition, and as we were given to understand, the joists likewise. Another step ladder led to the second floor, the rooms of which were prepared in the same way. The house was not fitted with either doors or windows, or any wood work beyond what has been mentioned; nor had it any of those quarter partitions which are so well known to help to spread a fire from one floor to another.

Shavings and wood were distributed in all the rooms; sufficient probably in each to set on fire the floor of an ordinarily constructed apartment. But the front room on the first floor had some additional preparations, which must be mentioned. Above the composition protecting the boards of the floor was spread a veneer of half-inch deal boards; in order to show that the usual appearance of a boarded floor might be had if required, in the fire-proof room. A bedstead with bedding and curtains, a set of chairs, a chest of drawers well filled with shavings and left negligently open, completed the furnishing of the room;—not splendid certainly, but adequate for the purpose, and good enough to burn.

The experiment commenced by firing the fuel on the floor of the top front room: the flames made no great show, and people said there was not enough heat to try the material; still we fancied in an ordinary house such a bonfire on the floor of an upper room would have spread certainly downwards, probably upwards;—here it died out harmlessly. A similar result followed the firing in the top back room. Then came the experiment to which we looked with most interest, the firing of the furnished lodging room. Here the flames burst out furiously, and would by night have looked terrific; as it was, the volumes of smoke, especially that which issued through the chimney, showed that everything was alight and the heat rising powerfully. It soon took effect on the ceiling, so far as to detach the smooth floated coat of plaster in large patches; and the crowd hooted and fancied they were going to have a real instead of a sham fire. We had understood however that this might and probably would happen; and we looked on with interest to see what next would come. The ceiling continued firm, the floor exhibited no signs of giving way, and the fire here too died out, not spreading beyond the room. The wind, we should observe, set from back to front, but not very strongly. On going into the room underneath, while the fire was still too hot to allow us to go into the lodging room itself, we found the ceiling as perfect as ever, apparently totally unaffected by what was going on above. Subsequently the fuel was ignited in the back rooms, first the upper one, afterwards the lower; but these experiments did not exhibit any new feature, except that the step ladders were exposed to the fire, which however was not very powerful though sufficiently so we think to have kindled them had they been unprotected. We left when the experiment seemed to be concluded, satisfied that the front room first floor especially had stood a severe test, and determined to examine it minutely when cool next day.

The next day accordingly we carefully examined the house. To mention first the rooms which had been the least severely tried; the floors were all firm and safe though blackened, and the plaster changed in colour to a dingy brown, something like Roman cement. We do not know how many fires it is expected to stand; but we suppose only one, as it *will* crack off in parts by heat. The ceilings were also sound, with the exception of some slight cracks; and a small patch or two of the floated coat had come off in the upper rooms which were rather low, and thus their ceilings more exposed. The bond timber in the walls was well saved; the step ladders uninjured, but we detected a few parts peeled off especially where there was iron underneath. The iron expanding by the heat seems always inclined to throw off the plaster: the patentee intends to dispense with it in his ceilings for the future, where he does not consider it necessary; we do not know however with what material he designs to supply its place, and we greatly doubt whether something is not required to prevent the ceiling peeling off the laths by the force of the fire.

We were sorry not to find the front room on the first floor just as it remained after the fire of the previous day. We were informed that several scientific and professional gentlemen had been desirous of further testing the composition, with the view to ascertain what heat it would bear without transmitting sufficient to ignite the timber. For this purpose they had kept up a continued fire on one part of the floor and against the bond timbers of the wall, and had succeeded in extensively charring the wood underneath. The floor had also been removed in a great measure, in order to take up some gunpowder which had been deposited in papers underneath it. And here we must protest against this part of the experiment: it shows indeed the confidence of the patentees, and it has proved to have been a successful piece of rashness. Still rashness it was, we maintain; and gratuitous rashness. If the proprietors could prove that their prepared room would stand the burning, what need for anything further? They might have waited for *this* experiment, till they were rendering fire proof the first gunpowder magazine to which they may be called in.

We were informed that on clearing away the rubbish previous to taking up some of the boards of the floor, the boards were found very little injured. We can speak ourselves to the perfect soundness of the joists beneath: and we were personally beholden to the strength of the ceiling attached to them, as we chanced to stumble and come down somewhat heavily upon it, without damage. We have said that in removing the plaster from some of the bond timbers which had borne a long-continued firing, we found them charred. It is but fair however to state, that they had been built into the walls, without being coated all over; so that the fire was able to creep round them as the lime mortar crumbled away, which might not have been the case had they been prepared all over. The same remark applies to the upper lintel of one of the windows, which caught fire.

The company in their prospectus state, that their composition is applicable to "walls, ceilings, partitions, staircases, &c." In this experiment we have shown its application to the first two purposes: the possibility of applying it effectually to staircases, we doubt much; we do not think the material would stand the wear of feet passing up and down; and the plan of veneering over with thin boards does not seem practically applicable. So also in case of floors; the thin boards though at first lying flat enough, would after a few washings become hollow, and the floor uneven and unsightly. The composition itself looks uncomfortable to an eye accustomed to a boarded floor; and it remains to be seen how it will wear under carpets. The old plaster floors, still used in some parts of the country, will stand the heat of a fire upon them for a long time: not so however the joists by which they are supported, which must give way to fire underneath and let fall the heavy plaster floor. We have mentioned the colour of the composition; in other respects it appears much like common plaster: but as the patentee has not yet enrolled his specification, we cannot speak with any degree of certainty. It will be seen also, that the security afforded by it depends upon the coating not peeling off.

BLOWING UP OF WRECKS IN THE THAMES.

Colonel Pasley has lately been engaged in two important applications to practical purposes in the arts of peace, of his military attainments as Colonel in the Royal Engineers. His experiments on mining under water have been hitherto conducted on a small scale "upon casks loaded with gravel, or small unserviceable punts, &c.," merely for practice and the acquisition of knowledge. But his complete success in these two larger undertakings, will we fancy leave the corps of Royal Engineers no need to complain of want of practice in sub-marine mining: and navigation will be benefitted at the same time, by the removal of wrecks from the beds of navigable rivers.

We proceed to describe the first explosion; its process and its effects. It was required to remove the wreck of the collier brig William, of 400 tons burden, laden with a cargo of 300 tons of coal, sunk off Gravesend near Tilbury Fort, in about 23 feet water at the lowest tides. For this purpose, two cylinders each capable of receiving a charge of 2,500 lbs. of gunpowder, were

prepared at Chatham Dock-yard. They were made of lead, and surrounded with a casing of elm, 3 inches thick, 10 feet long, and 4 feet diameter; which was further strengthened by longitudinal bars connected at the ends by a framing. It was also hooped with iron; the hoops being however nearly cut through on the side intended to be next the brig, that the force of the explosion might be employed in the most profitable manner. Into the cylinder was fixed a fuze, communicating directly with only a small powder canister in the centre of the charge, to guard against extensive damage by the accidental admission of the water. The mode of explosion adopted, was by a small powder hose guarded by a leaden pipe. The fixing of the apparatus caused considerable trouble and delay. In the side of the wreck were fixed ring bolts to which the cylinder was afterwards attached: these operations were performed by means of the diving bell and diving helmet. The operations were conducted by a body of Royal Sappers and Miners, under the command of their officer, Captain Yule; the whole under the direction of Colonel Pasley, assisted by other officers connected with the naval establishment at Chatham. Operations commenced on Monday, May 21, when by some unfortunate accident, the life of a diver sent below to fasten the bolts, [illegible] the next day, the fuze and small canister attached were spoilt by [illegible] irruption of water, when all seemed ready for the explosion. Then at night the lighter employed above the wreck was run foul of by a ship passing by, and the working gear carried away. It was not till Monday, May 28, that the expected explosion took place. When all was ready, and signals made to keep all craft clear of danger, the fuze was fired by a party of miners in a cutter. It burnt for five minutes, giving time for the party to make their escape safely. The explosion appears to have been terrific; by land it was felt distinctly, though without damage, in all the neighbouring houses; and the water of the river was thrown up in a column, some say 70, others 100 feet high. The dense black vapour which arose at the same time, showed that the cargo of coals had been effectually reached; and the floating masts, planks, and timbers, proved that the wreck was entirely demolished.

It will be seen that the above account bears us out in our assertion in a former article (No. VIII., p. 198), that the ordinary mode of firing is uncertain except at moderate depths;—indeed here the depth was very moderate. The difficulty is of course increased by the strong tide of the Thames, and by the passing of craft in the river. We should however like to see Mr. Bethell's galvanic apparatus, which we described in the article referred to, fairly tried on some early occasion of a similar kind.

The other explosion which we design to mention, took place under the same able direction on Tuesday, the 5th ult. The wreck was that of the schooner Glamorgan, sunk athwart the channel of the Thames a little to the Westward of Coalhouse point, Gravesend Reach. The depth of water was five fathoms before the explosion, and from seven to seven and a half afterwards. The visible effect Colonel Pasley describes as "a very brilliant cone of clear water, sparkling in the sun, probably thirty or forty feet high, succeeded by a second water spout of a dark appearance, being mixed with mud from the bottom, and tinged by the gunpowder." Timbers, planks, &c., were found abundantly floating, as in the former instance. The charge of powder by which this effect was produced, was the same in amount, and in application, as that before described. Indeed it had been at the bottom twice before; once in one of the abortive attempts before mentioned; again it miscarried in consequence of the fuze pipe proving unsound owing to the damage received in a previous service; the third time, and with a new pipe, we have seen that it completely succeeded.

In a letter of Colonel Pasley's, dated the 5th ult., from which we have taken the above particulars of that day's operations, there are some interesting observations on sub-marine mining which will be interesting to the professional reader, and are important as resting on the gallant author's experience. In shoal water, and in a situation not exposed to such strong tides, he would prefer a number of smaller charges, not exceeding 40 lbs. each. Such charges have been previously applied in a ship's bottom as near the keel as possible. But it is often desirable to remove only the decks without injuring the rest of the vessel more than is unavoidable, to enable the divers to reach the cargo; or in the case of a steamer, to get out the engines. For this purpose says the Colonel, "I was induced on Saturday last, to fire an experimental charge of about 40 lbs. of gunpowder against the deck of the same schooner which we destroyed to-day; and, as it may not always be convenient to place charges of gunpowder under the decks, I placed this charge above and upon the deck of the forecastle of the schooner. On firing it, some pieces of plank came up to the surface; and on examining that part of the deck after the explosion, it was found that a hole had been made in it; and that the planks near it, which before were quite sound, had been loosened in consequence, and the iron bars with which the vessel was laden might be felt, though before they had been inaccessible."

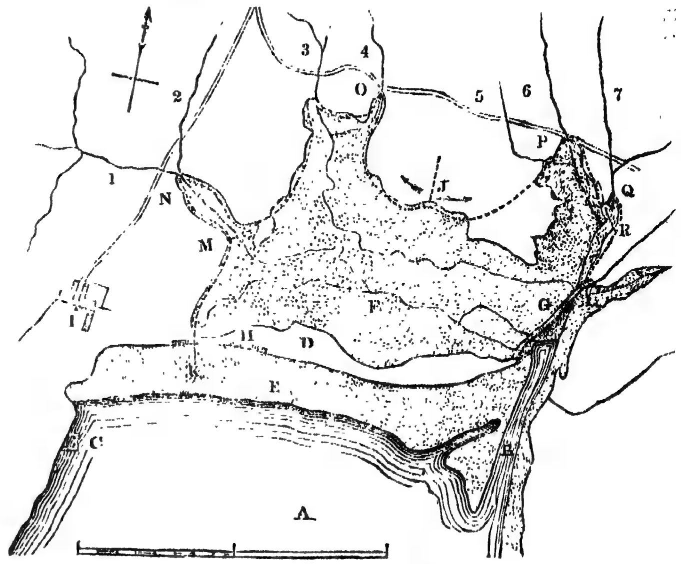
On the success of these operations, we congratulate both the able con[illegible] of them, and those who will be benefitted by them,—all concerned in [illegible] of the river. Further experience will we doubt not abridge the [illegible] and increase the certainty of the process, till it becomes the ordinary [illegible] to blow up such wrecks as it is found impossible to weigh.

The French papers of March, notice with praise an equestrian statue of Emanuel Philibert, Duke of Savoy, by M. Marochetti, cast in bronze by M. Soyer, which has been recently set up in the interior court of the Louvre, previous to its being forwarded to its destination, in Chambery, the commission having been given by the King of Sadinia. It is said, too, that thirty-five statues of marble, for the niches beneath the colonnade of La Madeleine, have been recently ordered by government, and 6000 kilogrammes of bronze, delivered, by royal command, to the town of Albi, for a statue of La Peyrouse.

TRAMORE STRAND, IRELAND.

(Continued from p. 229.)

[We repeat the map given in our last number, p. 227, with the addition of certain letters and figures of reference for the explanation of the following additional extracts from the Report.]



Furlongs 8 0 1 Mile.

References to the Map.

A, Tramore Bay as it appears at low water.—B, Rhineshark Channel.—C, Proposed Pier.—D, the Burrow, or neck of land, dividing the Front and Back Strand.—E, Front Strand of Tramore, which is covered at high-water. F, the Back Strand, now covered at low-water, which it is proposed to embank in, and thus reclaim.—G, Embankment to be made.—H, Sea-wall to be erected to strengthen and protect the narrow and weaker portion of the neck of land between the two strands.—I, the town of Tramore.

The dotted lines show the new catch-water drains which it is proposed to construct to carry off the water flowing from the rivers. The summit level of these drains is at J, from which point they fall to the East and West, as shown by the arrows. The Eastern drain discharges itself at L, in the Embankment G, just below high-water mark: and the Western one flows out at K, in the sea-wall H.

Further Extracts from Mr. Bald's Report.

Having reported on the Back Strand of Tramore, and made out an estimate of the expense of embanking it in from the sea, I shall now proceed to describe the mode of discharging, by catch-water courses or drains, all the brooks and rivers which flow into it; and how it is to be sub divided by drains and fences, together with the general extent of the enclosures.

The extent of country draining into the back strand proposed to be embanked in, amounts to 9,100 acres, and which feeds eight brooks and streams; the quantity of water found in them by measurement on the 29th of January, 1838, amounted to 2,004 cubic feet per minute. At present, all these brooks and streams run through the back strand, and pass out by the straits of Rhineshark: by inspecting the map, it will be seen that it is proposed to give the river waters two points of discharge,—one at the point K on the front strand, into the sea,—and another at the point L into the Rhineshark channel at the Eastern end of the great embankment G. These points of discharge are to be above the level of high water spring tides.

On the Western side of the strand, a catch-water drain is to be constructed, commencing at the point O; and which is to be carried along by the foot of the high land, through M, to the discharging point K at the front strand. This catch-water drain in its course will receive the waters of the brooks and rivers marked on the map Nos. 1, 2, 3, and 4. The upper part of the catch-water drain from O to M, will be 3,300 yards long, 10 feet wide, with a sectional area of 1,728 superficial inches, a mean hydraulic depth of 13.29 inches, and a fall of 18 inches in a mile: it will convey more than 1193.40 cubic feet per minute. A section of it is shown in fig. 1. The catch-water drain from N which is to convey the waters of the rivers Nos. 1 and 2 to the point M, is to be 880 yards long, 15 feet wide, with a sectional area of 3,600 superficial inches, a mean hydraulic depth of 18.55 inches, and a fall of 18 inches in a mile; it will discharge more than 2,880 cubic feet per minute. A section of it is shown in fig. 2. At the point M the waters of the brooks and rivers Nos. 1, 2, 3, and 4 will be united; and from this point M, to the discharging point K on the front beach, there is to be a catch-water drain of 18 feet in width, 1,320 yards long, with a sectional area of 5,184 superficial inches, mean hydraulic depth 22.34 inches, and a fall of 18 inches in a mile; it will discharge more than 4,642 cubic feet per minute, the mean daily average quantity per annum being under 1,140 feet per minute. A section is shown in fig. 3.

The water received by the catch-water drain extending from O to P, 6 feet in width, and 4,480 yards in length, will be in equal portions delivered into the catch-water discharging drains on the western and eastern sides of the back strand, from the point marked J on the map.

On the Eastern side of the back strand, a catch-water drain is to be constructed from the rivulet No. 6, P to R, 1,320 yards in length and 10 feet wide; and from No. 7, Q by R to L, a catch-water drain of 15 feet in width. This latter drain, with a sectional area of 3,600 superficial inches, a mean hydraulic depth of 18.55 inches, and a fall of 18 inches in a mile, will give a discharge of 2,880 cubic feet per minute (see fig. 2); the mean annual discharge is under 864 cubic feet per minute. All the catch-water drains round Tramore back strand, are to discharge their waters into the sea above high water spring tides, at the points marked K and L; or they may be made to pass wholly out by the Rhinesbark channel.

Having shown how all the land waters running to Tramore back strand can be discharged into the sea without passing through the strand, it now becomes necessary to calculate the probable quantity of rain water which falls within the back strand. The area of the land proposed to be embanked in, is 1,425 English acres: taking the annual quantity at 36 inches in depth for rain and springs, &c. over this surface, the following will be the result:—

$43{,}560 \times 3 \times 1425 = 18{,}621{,}900$ cubic feet per annum.

$\frac{18{,}621{,}900}{365} = 51{,}018$ cubic feet per day.

$\frac{51{,}018}{28} = 2{,}126$ cubic feet per hour.

$\frac{2{,}125}{60} = 35 \cdot 4$ cubic feet per minute.

It is proposed that this quantity of water shall be sluiced out through the great embankment G; and also through the beach into the sea at the point K: or it may be more effectually discharged by a small steam engine of fifteen horse power.

It is proposed to run a main line of road from near the town of Tramore through nearly the centre of the whole back strand; another line of road from the embankment to the point marked P on the map; and a third from the Western end of the Burrow, crossing the whole strand in its greatest breadth: these roads are to be twenty five feet wide, and to be constructed in a solid and substantial manner. From these main roads there are to branch four narrower lines of road crossing the back strand in various directions; they are to be eighteen feet wide.

The back strand has been divided into compartments containing about fourteen and a half acres each; these are to be separated from each other by drains from six to eight feet wide, with an earthen fence on each drain side formed with the material excavated out of the drain, and which may be planted with osiers.

It would be necessary to shut out the Burrow D, and fix a portion of the moving sand of which it composed, that it might not spread and blow in upon the part of the back strand adjacent to it. A broad screen or belt of planting throughout its whole length, might effectually prevent the sand blowing in. The moving sands at Bordeaux in France, have been arrested and fixed by being planted over with trees; and I think that the moving sand on the Northern edge of the Burrow bounding the back strand might be secured in a similar manner. For, although the position is very maritime, yet from the height of the sand hills, the Burrow would afford to the growth of trees on its side great protection from the prevailing Westerly gales.

In the report already furnished, it was recommended in the first instance to lay down a stone rubble dyke, in the line of the proposed embankment G, in order to intercept the alluvial matter carried into the back strand by the brooks and rivers; this operation would raise the surface of the strand by depositions of the most valuable kind. And if it should afterwards be nece[illegible] to sweeten the soil of the back strand, and free it from any super abun[illegible] saline matter that it might contain, its whole surface could be inundated with fresh water, and sluiced off seawards, as frequently as might be required. The sectional areas of the sluices will be equivalent to 119 superficial feet.

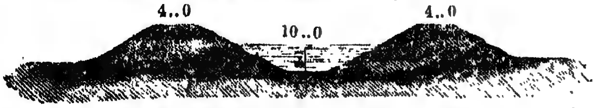
From the rich nature of the soil of the back strand, and from an experiment having been made by enclosing a very small part of it, which gave an abundant return, I am of opinion that the greater part of it will be found to produce luxuriantly both green and grain crops of all kinds, as soon as the sea has been shut out by embankment.

(*Signed*) WILLIAM BALD,
Civil Engineer.

Dublin, 1838.

DRAWINGS AND CALCULATIONS ILLUSTRATIVE OF THE REPORT.

FIG. 1.—Section of Drain from O to M, and from P to R.



This drain, with a fall of 18 inches in a mile, will give the following discharge.

Let μ = mean hydraulic depth.
λ = twice the descent in inches per English mile.
v = velocity.

$v = \cdot 91 \sqrt{\mu\lambda}$

$\sqrt{24^2 + 48^2} = 53$ Inches.

$2 \times 53 + 24 = 130$ Periphery in inches.

$\frac{120 + 24}{2} \times 24 = 1728$ Sup. inches sectional area.

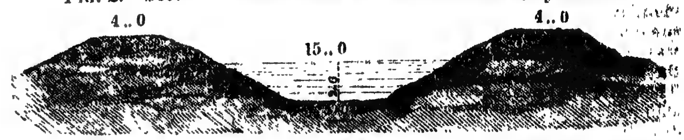
$\frac{1728}{130} = 13 \cdot 29$ Mean hydraulic depth.

$\cdot 91 \sqrt{13 \cdot 29 \times 36} = 19 \cdot 89$ Inches velocity per second.

$\frac{19 \cdot 89 \times 1728}{1728} = 19 \cdot 89$ Cubic feet per second.

$19 \cdot 89 \times 60 = 1193 \cdot 40$ Cubic feet per minute.

FIG. 2.—Section of Drain from N to M, and from Q by R to L.



This drain, with a fall of 18 inches in a mile, will give the following discharge.

$v = \cdot 91 \sqrt{\mu\lambda}$

$\sqrt{60^2 + 30^2} = 67$ Inches.

$2 \times 67 + 60 = 194$ Periphery in inches.

$\frac{180 + 60}{2} \times 30 = 3600$ Sup. inches sectional area.

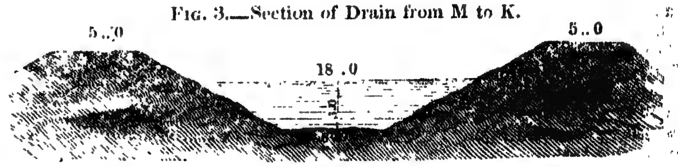
$\frac{3600}{194} = 18 \cdot 55$ Inches mean hydraulic depth.

$\cdot 91 \sqrt{18 \cdot 55 \times 36} = 23 \cdot 49$ Inches velocity per second.

$\frac{3600 \times 23 \cdot 49}{1728} = 48$ Cubic feet per second.

$60 \times 48 = 2880$ Cubic feet per minute.

FIG. 3.—Section of Drain from M to K.



This drain, with a fall of 18 inches in a mile, will give the following discharge.

$v = \cdot 91 \sqrt{\mu\lambda}$

$\sqrt{72^2 + 36^2} = 80$ Inches.

$2 \times 80 + 72 = 232$ Periphery in inches.

$\frac{216 + 72}{2} \times 36 = 5181$ Sup. inches sectional area.

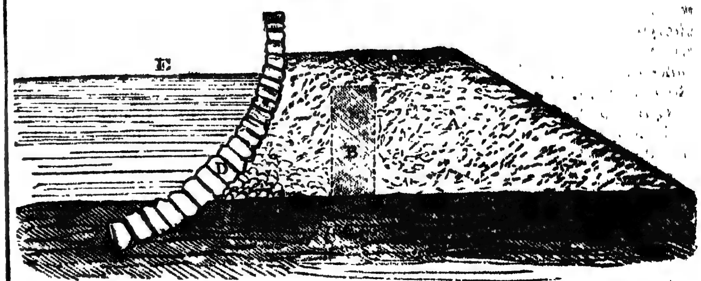
$\frac{5181}{232} = 22 \cdot 34$ Inches mean hydraulic depth.

$\cdot 91 \sqrt{22 \cdot 31 \times 36} = 25 \cdot 79$ Inches velocity per second.

$\frac{5181 \times 25 \cdot 79}{1728} = 77 \cdot 37$ Cubic feet per second.

$77.37 \times 60 = 4642$ Cubic feet per minute.

FIG. 4.—Section of Embankment G.



References.

A. Embankment, 15 feet high and 18 feet wide on the top, with a slope of $1\frac{1}{2}$ horizontal to 1 perpendicular.
B. Puddle Dyke, 12 feet high by 4 ft. 6 in. broad.
C. Natural bed of the bay.
D. Stone wall, the top 4 feet above the embankment.
E. High water mark, spring tides; three feet below the top of embankment.

GREAT WESTERN RAILWAY.

The first portion of this important railway, from Paddington to Maidenhead, a distance of 23 miles, was opened on Thursday May 31st by an experimental trip being made by the directors and a party of friends; and on Whit-Monday June 4th, it was opened to the public. We deferred paying our visit until the 15th ult., that we might be the better able to judge of the works after a few days' trial; and we shall now proceed to make some remarks founded upon our observation on the day of the trip, and during the progress of the works.

We must first say a few words with regard to the opening of the railway thus early. We consider it a very impolitic measure, and the directors censurable for so doing; a considerably longer time ought to have been taken, and every engine tried before they opened the line to the public, instead of allowing daily failures in consequence of the defective state of the engines. Scarcely any of them, with only one or two exceptions, are of sufficient power to work on the line.

In consequence of the greater space between the rails, the carriages are of considerably greater weight than on other lines; the day we visited the line we were conveyed in a train consisting of one open carriage containing 72 passengers, and four close carriages containing if they were all full 24 persons each; making a total load of 168 passengers. With this load, the engine could not move the train at starting; the attendants were obliged to put their shoulders to the wheel and push on the carriages to give the train an impetus. We then went slowly on until we had gone a distance of about three miles, and here the engine was brought to a dead stand still, for about a quarter of an hour; we believe the fault was owing to some part of the carriage of the locomotive being defective; as after the engineer had done something to it, it progressed and performed the remainder of the journey at the rate of 20 to 25 miles per hour. We were informed that these delays have been frequent, and it is very evident that some of the engines cannot do their duty. When we were at Maidenhead, we noticed that some of the engines arrived five minutes within the hour, allowing for five minutes' stoppages at the two stations on the line; they must have travelled at not less than 27 miles per hour. This clearly shows that with proper attention to the power of the engines, the journey might be performed at the rate of at least 30 miles per hour; but even this is not a greater speed than what we understand is now being performed on the Liverpool and Manchester Railway.

We shall now proceed to make a few remarks with regard to the construction of the line. We shall first consider the effect of adopting 4 feet gradients, which have been obtained at an enormous outlay. In consequence of the great height of the embankments, and the lightness of the cuttings, a considerable portion of those embankments has been formed from side cuttings, and the soil drawn up inclined plains by the aid of stationary steam engine. If the gradients had been the same as on the Birmingham Railway, viz. 16 feet per mile, several feet in height would have been saved in the embankments, and the cuttings would have been deeper; by which means sufficient soil might have been obtained, without having recourse to side cuttings, and thus several thousand pounds might have been saved both in the embankments, viaducts, and bridges. We very much doubt if there be any great saving by adopting 4 feet gradients; for if the gradients do not exceed the angle of repose, say 16 feet per mile, there is as much saved in the descents as nearly if not quite compensates for the ascents. This point will be set at rest very shortly by a comparison of the working of the two great railways, the Birmingham and the Great Western. So in like manner will be seen the advantages or disadvantages of the two different gauges for the rails, viz. 4 ft. 8½ in. and 7 feet; up to the present time it is impossible to say which is the best.

Much discussion has taken place relative to the system adopted by Mr. Brunel for laying the rails, explained in a former number of the Journal, (No. VII. page 166*). It would be premature to offer an opinion on the merits of the system; we must wait for a short time, and see what effect the engines will have produced on Mr. Brunel's rails after two or three months' working. It is very evident from the immense number of hands employed to keep the ground-work packed under the sleepers, that they require as much attention as on other lines where time has not been allowed for the embankments to settle and become consolidated.

We very carefully examined the bridge over the river Thames at Maidenhead. It consists of two flat elliptical arches, each 128 feet span and 24 ft. 3 in. rise or versed sine, constructed of brick and cement; the thickness at the springing is 7 ft. 1½ in., and at the crown 5 ft. 3 in. The arches are turned in half brick rims and bonded occasionally with whole bricks through two rims. We regret to say that there are evident symptoms of failure in the Eastern arch, the centering of which has been eased or lowered 3 or 4 in. A space remains of about 4 in. between the lower part of the arch, the haunch, and the centering; and there is also a space between the under side of the crown and the centering: but that portion of the arch between the haunch and the crown has followed the centre and rests upon it: whereby it has forced up the crown and crippled it, causing also two vertical fractures in the Eastern spandrels. The other arch seems to stand firmly, although there is a slight appearance of the vertex or crown of the arch being crippled, but not dangerously so. The abutments appear to be very secure; the materials are of the best description, the bricks are hard, well burnt stocks, equal to marl paviors; there is no appearance of either the bricks or cement crushing. At the crown of the arch which is so much crippled, the cement curvilinear joints have divided, but not crushed. The centering is very strong, and the only objection we have to it, is allowing it to rest on piles driven midway in the stream. We decidedly prefer supporting the centering from the abutments, in a similar manner to the Waterloo Bridge centre, in which case more dependence may be placed on an equal settlement of the whole; and the centering is better eased by adopting the same description of wedges as used for the Waterloo Bridge centre. This is however quite a matter of opinion, and we have against us several eminent engineers who have adopted the same mode of construction as that of the Maidenhead bridge; we consider it a point well deserving of attentive consideration, as on the firmness of the centre depends the stability of the arch.

* By an accident in the press, two of the cuts, fig. 3 and 4, were inadvertently printed upside down.

Having said thus much respecting the Maidenhead bridge, we will turn our attention to the Viaduct over the Brent at Hanwell, consisting of eight arches, 70 ft. span each, and 70 ft. high from the level of the surface of the river to the top of the parapet. It is constructed of brick with Bramley Fall stone dressings, forming the bases, caps, cornices, and coping. The diminishing of the massive piers, the contour of the mouldings and the boldness of the whole, give an Egyptian architectural effect, which is particularly grand and imposing. We consider this viaduct decidedly the best piece of railway engineering architecture that we have yet seen on any railway. We wish we could say the same of the girder bridge over the Uxbridge road close by the viaduct. It appears as if it were placed there as a contrast, to show how vilely and how nobly works of railways may be designed. Mr. Brunel will, we hope, pardon us for this freedom.

The buildings at the Terminus and the Stations all appear of a temporary character, although constructed at a great expense; they are principally of timber, which we consider decidedly objectionable, particularly for the sheds under which the carriages and the locomotives stand, and where the latter discharge their burning fuel at the termination of their day's work. The danger arising from sparks, burning soot, and hot cinders, flying about and lodging on the timber of the roof, is fearfully great. The roof ought unquestionably to be of iron, as at the Birmingham station, notwithstanding that they may have been only erected for temporary purposes; as an iron roof might be as easily removed as a timber roof, if not more so; and the difference in the cost ought not to be a consideration for such a purpose, although a roof of iron is about double that of timber. At the terminus at Paddington is a polygonal building for the locomotives or carriages; this is a very economical method of construction for such purposes, as one turn plate in the centre answers for placing all the carriages in the several departments round it. In the case of a building of a longitudinal form, a turn-plate is necessary opposite every department, as in the engine and carriage houses at the Euston Square Station of the Birmingham railway; which is the cause of a very heavy expenditure for the turn plates only.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

Report of Papers read and Proceedings, Session 1838.

(*Continued from page 229.*)

Colonel Pasley on firing blasts under water by Bickford's fuzes.

Great advantage in blasting under water is derived from the use of Bickford's fuzes, applied to tin powder cases; also from the new system of tamping by means of small stones, and of fixing ring-bolts in stones or rocks, introduced by Mr. Howe. But the Bickford's fuzes are not altogether efficient in very deep water, say from 5 to 10 fathoms; though superior to any other in shoal water. The general practice has hitherto been, to ignite the powder contained in a tin canister, by dropping a piece of red hot iron down a tin tube reaching to the surface. The tin tubes being liable to failures, Colonel Pasley had used flexible leaden pipes, employing a piece of portfire instead of red hot iron, for vertical explosions. Several other means of firing, as small rockets, a quick match, and small linen hoses were tried; but without success. A small fine powder hose about one-eighth of an inch in diameter, secured so as to burn gradually instead of rushing forward and exploding, was found to succeed very well; but it is neither so simple nor so cheap as the Bickford's fuzes. These fuzes consist of so minute a thread of fine powder that they burn rather than explode, and are in no danger of bursting the case, which is made of twisted hemp coated with pitch, and so performs the double duty both of the hose and the metallic tube. The fuze having been ignited, is thrown on to the water, and generates a small column of elastic gas as it burns.

Colonel Pasley details several instances of the successful application of these fuzes, and proceeds to describe the general arrangements which were adopted by him; the fitting up of the tin cases; the mode of firing; the best borers for blasting under water; and a form of plug bolt peculiarly adapted for mooring and warping up rapids. The fuze was inserted through the cork, and upon the tin case was placed an iron cone having a small groove at the side of the base to admit the fuze; and the top of the hole was filled up with small pieces of hard stone of about three quarters of an inch in diameter, as tamping. The plug bolt, which is 3 feet long and 1¾ inch in diameter, (having about four inches of the bottom end spread out into a cone, of base about three inches,) is inserted in a hole cut a little oblique towards the current, and fixed in the same manner by pieces of stone. From experiments on tamping the holes of blasts with loose sand, it appeared that double the charge of powder was required to produce the same effect when the whole was filled with loose sand, as when filled by ramming in fragments

of bricks; but the method above described is far the most efficacious, saves trouble, and is less liable to accidents.

The Bickford's fuzes as originally made, were found several times to fail in 10 fathom water, and some larger ones burst the envelope; so that Colonel Pasley is of opinion that in deep water some other means should be resorted to. Also when a large quantity of powder is to be fired, the time which the fire is burning, namely about half an hour in 8 fathom water, keeps the experimenters in a great state of uncertainty as to when the fuze has ceased to burn: the small air bubbles sent up to the surface being generally imperceptible except at a small distance. In these cases the use of the small hose and leaden pipe is preferable.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At an Ordinary General Meeting of the Members, held on Monday the 11th of June, 1838,

P. Hardwick Esq. v.p., in the Chair,

The Right Honourable the Earl of Aberdeen, was elected an Honorary Fellow.

A letter was read from J. G. Wilkinson Esq. acknowledging his election as Honorary Member: also the following letter;

To the Right Honourable the Earl de Grey,
President of the Institute of British Architects, London.

My Lord,

The medal and the copy of the transactions of the Institute of British Architects, which your Lordship did me the honour of sending, were delivered to me a few months ago by Lieut.-Col. Thomas M'Lean, British Resident at my Court; and it is impossible for me to express my feelings of gratification at the distinction which your Lordship as the President of one of the most useful institutions, has been pleased thus to confer upon me. I cannot however refrain from requesting your Lordship to accept and convey to the Society my sincere acknowledgments on the occasion, as well as an assurance that I shall always feel a lively interest in the prosperity of an Institute, whose researches cannot fail to secure to the rising generation such an improvement in Architecture, as will join the solid simplicity of the ancient, to the ingenious elegance and scientific knowledge of the modern times.

I beg to apologize for the delay which has unavoidably occurred in making this communication to your Lordship; but I was anxious that it should be accompanied by the drawings I had intended to forward, of some buildings which are celebrated in this country for their sculpture. These I do myself the honour of transmitting, with explanatory notes attached to them. But I am sorry that I could not furnish myself with accurate information as to the time when the temples were erected, though most of them are generally believed to be the works of the Chóla dynasty, which probably commenced in the 13th century. Next to the temple of Avidian Coil in point of time, is the Pagoda in the fort of Tanjore; and all I could gather from the inscriptions left upon the base of this, is that it was built in the 1237th year of the Shaleevahen era, or about 522 years ago. I might have added to the accompanying set of drawings, a plan of the bridge lately constructed at my expense by the British government across the river Vinnar, in the vicinity of Tanjore: but I understand that a drawing of it was some time ago forwarded to England for the inspection of the India Board.

I am sensible that these drawings will contribute but little towards the labours of the British Architects: I have only to request that they may be accepted as an earnest of my anxiety to render my services to their Institution.

I have the honour to be
My Lord, your Lordship's
Most obedient Servant,
(Signed) Seevajee Rajah.

Tanjore Palace,
30th Jan., 1838.

The following donations were announced as having been received since the last Ordinary Meeting. Antiquarian Society; Archaeologia, vol. 27.—Owen Jones Esq., Architect; Nos. 4, 5, 6, and 7 of his work on the Alhambra, in gold; and two coloured and gilt casts of ornaments from do.—W. Behns Esq.; bust of the late J. Nash Esq. Architect.—W. R. Hamilton Esq. Honorary Fellow; copy of his address as President of the Geographical Society.—Thomas Walter Esq., Architect, of Philadelphia, U. S.; pamphlets connected with the erection of Girard College in that city.—G. Godwin Jun., Associate; No. 18 of his work on the Churches of London.

C. Barry, V. P. being present, a series of 24 architectural drawings by various masters, and four prints, were announced as having been forwarded to him for the Institute by Sir John Drummond Stewart, who had however died at Paris since they were forwarded. Mr. Barry represented to the meeting that in all his communications with this liberal contributor to the collection, he had ever expressed a lively interest in the purposes and welfare of the Institute.

J. Goldicutt, Fellow, read a description of the mode of transferring some Frescoes painted by Paul Veronese, on to canvass from the walls on which they had been painted; illustrated by the exhibition of the specimens recently imported from Italy.

Thomas Griffiths Esq. commenced his series of papers on Chemistry as applicable to construction.—Introduction;—chemical properties of earthly materials, and their artificial combinations, employed in building.

ARCHITECTURAL SOCIETY.

This closing conversazione for this season, at which the several prizes to the Student Members were awarded, was held at the Society's rooms, 35, Lincoln's Inn Fields, on Tuesday evening, 5th June.—W. B. Clarke, Esq., F.S.A., &c., President, in the Chair.

Several letters were received, from the Earl de Grey, W. Ridley Colborne, Esq., Mr. Alderman Copeland, M.P., and many others, expressive of their regret at not being able to attend, in consequence of absence from town and prior engagements. Mr. Owen Jones, Member, presented Nos. 4, 5, 6, and 7 in continuation of his work "La Alhambra," for the acceptance of the Society. The Secretary then read the annual report; after which the President read a most interesting and appropriate paper; copies of both of which are given below.

At the conclusion of his address, the President distributed the following prizes to the several successful competitors:—

To Mr. Thomas Morgan, Student Member;—for the best measured drawing of the Gateway on each side the Quadrangle of Somerset House;—Sir Wm. Chambers's Civil Architecture, 2 vols.

To Mr. George Rutherford, Student Member;—for the best Essay on the History of the Arch;—Hope's Architecture, 2 vols.

To Mr. George Rutherford, likewise was presented the work annually given by Mr. George Mair, V.P., for the greatest number of approved sketches during the session.

To Mr. William Nunn, Student Member;—for the most approved drawings of the Garden Front of the Travellers' Club House, Pall Mall;—Mr. Owen Jones's work "La Alhambra."

To Mr. G. B. Williams, was presented another copy of the above work, by the liberality of Mr. Jones, in consequence of his merit and that of Mr. Nunn being considered to be so nearly balanced. The President addressed each student at the presentation, on his success; trusting that it would create a greater thirst within themselves and in others to perfect their minds in the various branches of their profession.

The attention of the meeting was then called to a newly invented instrument for the purposes of levelling, &c., by Monsieur Tachet of Paris, recommended from its portability and cheapness.

Mr. R. R. Reinagle, R.A., communicated to the Society the formation of a company for supplying London with water and the formation of fountains in various parts of the metropolis and its environs.

The Society then adjourned until November, when they will again resume their meetings.

ANNUAL REPORT OF THE COMMITTEE.

Gentlemen,—This being the last public meeting of the Society prior to the termination of the present session, your Committee have the pleasure to submit to you notice their annual report, which they are led to believe will be found as favourable as those of former sessions.

The President having announced at the last conversazione, that His Royal Highness the Duke of Sussex had been pleased to become Patron of the Architectural Society, and having then stated most fully the advantages which would consequently arise from so auspicious an event, as well as the renewed energy which this distinguished patronage would impart to every member; it is unnecessary for your Committee again to dwell upon the subject, and they will therefore revert without further delay to a most important point in your transactions;—the annual distribution of prizes to the class of Student Members—a measure adopted for the first time last session.

The Committee cannot but congratulate the Society upon the beneficial results which have already arisen, and are likely to develope themselves from this circumstance; being as it is one step towards the formation of a School of Architecture,—one of the primary objects of this Society.*

The interest arising from the munificent gift presented by the late Professor of Architecture, Sir J. Soane, having been appropriated for the purchase of the yearly prizes,—and the knowledge of his liberality, combined with the cheering encouragement which he always extended towards every department of the Fine Arts,—cannot fail of adding an additional stimulus to the exertions of the competitors; and your Committee have great pleasure in calling your attention to the several drawings and essay compositions, which have this year been submitted in competition. And while they conceive that the labours of those gentlemen will be considered as highly satisfactory, they regret that no competition should have been entered into for the first prize; and they venture to hope that on no future occasion will the Student Members fail to avail themselves of the opportunity thus afforded them of exercising their talents in the class of Design.

In addition to the prizes annually awarded by the Society, the members have to acknowledge themselves indebted to Mr. George Mair for the encouragement he has given to the Student Members, in having announced his intention of giving annually a prize, to that student who shall produce in the course of the session the greatest number of approved sketches, from subjects given by the Sketching Committee.

The members have likewise to tender their best thanks to Mr. Owen Jones, who has most liberally awarded to that student who should produce the most approved drawings of the Garden front of the Travellers' Club House, a gold copy of his interesting work on the Alhambra; and the merit of the competitors for this subject being so nearly balanced Mr. Owen Jones has consequently declared his intention of presenting another copy as a second prize.

To Mr. Charles Barry and the Committee of the Travellers' Club, your Committee beg to offer their grateful thanks for the ready acquiescence with

which the request of your Committee on behalf of their Student Members was received, and for the facilities afforded to those gentlemen in measuring the building.

The Committee are happy to observe that the contributions, both to the Library and Museum, have been as interesting and numerous as the donations received during former sessions; and although the annual report of the Society's finances has not yet been prepared, there is every reason to anticipate that it will be found satisfactory to the members.

The Committee on behalf of the Society much feel the obligation they are under to the gentlemen of the Press for the handsome manner in which they have noticed the conversazioni and the meetings of the present Session. Nor can they close their report, without expressing their thanks to the Visitors who have honoured the Society by their presence on those occasions; and they beg to state that the Society's meetings will be resumed in November next, due notice of which will be given.

PRESIDENT'S ADDRESS.

GENTLEMEN,—I have the honour to address you on the occasion of the second annual award of prizes made by the Architectural Society, with the praiseworthy view of raising a spirit of emulation among its students. The very laudable endeavours of the members of this Society to arouse that desirable spirit of emulation, have met with the most complete success, and the honourable ambition of the students, displayed in the drawings around us, amply testify the ardent desire to attain to eminence in the science of Architecture.

The studies which hang around, and which exhibit in their outline very considerable taste, and in their execution no little patience, will be referred to by these gentlemen with an unmixed pleasure in after years; they will then feel, if they have not already ascertained the fact, that by the labour they have undergone, they have acquired not merely an increased facility of drawing, but a very considerable enlargement of mind by the study of these simple and beautiful architectural combinations. The study of the Travellers' Club, the work of Mr. Barry, cannot fail to enlarge their sphere of taste, and give an excellent direction to their yet perhaps unfixed ideas of architectural beauty and combination in domestic architecture.

The drawings are what are termed geometrical, or presenting every point of the façade to the eye at the same moment. Geometrical drawing is the great means by which the architect conveys an accurate idea of his design, to the workmen who are to carry it into execution. This species of drawing requires extreme accuracy; in default of which the architect must expect his errors to be faithfully executed by his workmen. There are many parts of geometrical drawing which are not always understood by our architects, but with which it is very desirable they should be acquainted. I consider it therefore a duty to point out some of the defects in our knowledge of geometrical drawing, arising in a great measure from our love of effect, indulged to the detriment of a sound acquaintance with the dry but useful details of this art.

The plan, the section, and especially the elevation of an edifice are the subjects to which we principally devote our attention in geometrical draftsmanship, whilst we almost entirely neglect the detail of the drawings; which on a larger scale, should convey an accurate idea of the minutiæ of construction, and most especially of constructive carpentry. As long as objects are parallel in all their parts to the eye, they present no very obvious difficulties in delineating; but when the objects to be delineated are curved, or angular, or polygonal forms, if we are unacquainted with the correct principles and practice of geometrical drawing, we shall be unable to convey the correct ideas of such figures, so as to enable the workmen to execute them accurately.

I have touched upon this subject in order to induce the student to reflect upon the necessity of a more careful study of geometrical drawing than is learnt in the ordinary routine of an architect's studio. In all geometrical drawings however it should be borne in mind, that the simple outline conveying an accurate idea of the form designed should be paramount. The shadows introduced should be projected according to true principles, and the effect should be in an elevation, simple and chaste. By simple and chaste I mean that there should be no factitious shadows thrown upon the edifice, nor artificial aid of landscape to a geometrical drawing. I would even recommend that the imaginary tints of the stone should be omitted; as they tend, especially on a small scale, to interfere with the delicate lines of shade which are produced by your combinations of form. The only artificial aid which I would recommend, should be a slight tint of back ground to give relief to your whole map. The love of factitious shadows and artificial effects, with the addition of landscape, has arisen entirely from the union of the schools of architecture and painting in the halls of the Royal Academy. This union, and the captivating charm of colour which has arisen from it, has unfortunately led to a perverted taste in architectural drawing; our architects endeavouring in their studies rather to emulate the effects of the painter, than to display in simple purity the form and appearance of their architectural combinations. The simple outline was rigidly adhered to by the old masters who combined architecture with painting, and though enabled by their skill in light and shade to produce a striking pictorial effect, they pursued what I would call the right course of geometrical drawing,—that of simplicity and purity.

These great masters also combined with their architectural knowledge, a mastery in delineating from nature, which is rarely acquired even by our greatest painters. The power of drawing natural objects as they present themselves to you, is one which should be carefully studied by the architect; at the same time it is one which is most usually neglected by him. Without this power many an opportunity will be lost, of hastily seizing an idea which in the course of his travels may present itself in the architectural combinations not only of Italy, but of other countries of Europe in which he may pursue his studies. I hold that a knowledge of drawing from nature is absolutely necessary to enable a man to become a first rate architect; without this knowledge he must either copy works already produced, or depend upon the taste of others for a thousand beauties which originate in this power. The student should carefully study drawing from the numerous works in the British Museum, as well as from the ample stores which nature in every shape and form constantly presents to him. Practically, I would recommend the advantages I have derived from tracing objects, combined at the same time with the study of subjects from nature; a course which I have often thought might even render more easy to the learner the art of writing, as tending to fix more accurately in the mind the forms of objects.

I shall conclude this short address by strenuously recommending the student to pursue the study of the many beautiful edifices to be found in this great city; a course which will facilitate his studies in Italy, where with the combined powers of the artist and the architect, he will cull innumerable excellencies from a thousand edifices, and return with a richer harvest of honourable spoils than many who, without these advantages, shall have preceded him.

I need hardly point out, for it is so very obvious, the honourable distinction which the Architectural Society have gained, by the useful course which they have continually pursued from the outset of their career. With humble means, but with hearts earnest in the cause of forwarding the science of Architecture, they have unweariedly pursued their honest way; and it is a proud satisfaction to think that their efforts have been crowned with success;—that the students enrolled in their numbers press forward with enthusiasm, and without a tinge of envy vie with each other in their laudable endeavours to reach the goal and bear away the prize; their greatest desire appearing to be that the most worthy should bear the palm. Let us therefore hope that this generous emulation, so worthy of a virtuous and free people, may produce architects who from their knowledge and taste may reflect honour on the noble country which has given them birth.

ZOOLOGICAL SOCIETY.

AT the late meeting of the Zoological Society, the Rev. F. W. Hope offered some observations on the great havoc committed by the Lymnoria terebrans, upon the piles of the pier at Southend, and exhibited a portion of the wood thus attacked by them. Deal is particularly attacked by this small crustaceous animal, which pierces the wood so that it crumbles, and the pieces are by the abrasion of the water, carried out to sea. It has been usual to char the wood, or case the lower part of the pile with copper; but in this case the animal gets in between the metal and the wood, and the same effect is produced, the piles shortly becoming good for nothing. The attacks of the Lymnoria are found in all parts of England on the coast; and it is now a question of economy whether the use of iron should not be substituted for wood, as the former might easily be protected by any kind of varnish or tar, which will not however consolidate the wood. Many experiments have, however, been made, and are still going on at Liverpool, to endeavour to preserve wood from the attacks of the Lymnoria, Teredo, and other similar destructive species. A member present stated that a great part of the pier at Brighton had been destroyed; and Mr. Clift also mentioned the same of Leith Pier, where almost all those parts of the piles between high and low water mark had been destroyed; those of the thickness of the body, being reduced to the size of the thigh. It had been proposed to preserve them by driving iron nails at short distances, where it was considered that the oxide of the metal would form an enamel that would preserve the wood; but this had no effect. It was also stated that no mode of preparation of the wood by corrosive sublimate, arseniate of potash, or other chemical agents, had any effect towards its preservation.

MEETING OF SCIENTIFIC SOCIETIES.

Royal Institute of British Architects, Monday evenings, July 9 and 23, at eight o'clock. Lectures by Thomas Griffiths Esq. on chemistry as applied to construction, Monday evenings, July 2, 9, 16, 23, at eight o'clock.

LAW PROCEEDINGS.

BAIL COURT. *June 1st.*

THE QUEEN *v.* THE GRAND JUNCTION RAILWAY COMPANY.

Mr. Cresswell moved for a rule to show cause why a writ of *certiorari* should not be issued to bring into this court the inquisition held on the body of a labourer of the name of Hawkins, alleged to be killed by accident. The inquest was held on the 26th January. The jury returned a verdict of accidental death, but that the death was principally attributable to the Merlin and Basilisk engines, upon which a fine of 150*l.* was levied. The peculiarity of the case required that the proceedings should be brought into this court.—Rule granted.

June 7th.

GLASTONBURY *v.* THE LONDON AND CROYDON RAILWAY COMPANY.

Mr. Justice Coleridge gave judgment in this case, which was a motion that a writ of *mandamus* should issue, calling upon the London and Croydon

Railway Company to summon a jury to award compensation to plaintiff for the loss of business he had sustained by that company purchasing the Croydon Canal. Plaintiff was a lighterman, and having taken an average of his profits for seven years and a half, claimed 1,205*l.* 7*s.* 8*d.*, for a period of four years and a half, according to that rate. The judge said that the forty-third section of the company's act of parliament limited the time of application for compensation to six calendar months after the injury sustained; and no notice had been given within the specified time. If plaintiff had been entitled to any compensation it would have been under the 35th clause of the local act, but it did not appear that he was the owner of any land on the line through which the railway was to pass; and as the company was only liable for land or property, it did not appear to his lordship that plaintiff was entitled to any compensation under the act of parliament.

TURNER *v.* THE NOTTINGHAM WATER-WORKS COMPANY.

His lordship also gave judgment in this case. It was a motion made last term for a *mandamus*, calling upon the Nottingham Water-works Company to call a jury to award the plaintiff compensation for loss she had sustained. The jury gave 500*l.*, which the company refused to pay. An application was then made to this court for a *mandamus*, calling upon them to pay the 500*l.* and the costs of the inquest. The court granted a *mandamus* for the payment of the 500*l.*, but refused it for the costs, as there was a legal remedy by distress. But his lordship now thought that as the application was not a joint application, but a distinct and separate one, the defendants might have said, "we will pay the 500*l.* but not the costs." He therefore thought plaintiff was entitled to all her costs; and the *mandamus*, calling upon defendants for the payment of costs, was granted accordingly.

COURT OF QUEEN'S BENCH, *June 7th.*

BURNABY AND OTHERS *v.* THE LANCASTER CANAL COMPANY.

Lord Denman gave judgment in this case. It was an action brought by the plaintiff for the loss of a vessel on the Lancaster canal, by reason of the negligence of the defendants. The plea was not guilty, and verdict was entered for the plaintiffs. The defendants on the occasion got a rule for a nonsuit. The court had heard the case fully argued, and had no doubt but that the action against the company could be maintained. That company had full powers to make their canal safe and navigable: it was a public thoroughfare, accessible to the public for a consideration, and to which even they were invited; and that company had no right to leave that canal in a condition prejudicial to life or property. They were somewhat in the situation of a shopkeeper who invites the public into his shop, but leaves a trapdoor open. The rule, therefore, for a new trial must be discharged.

IMPORTANT RAILWAY DECISION.

An action was lately brought by the Directors of the Cheltenham and Great Western Railway Company to recover from the defendant, Mr. Roberts, the sum of 53*l.* 16*s.*, the amount of shares of which he was the registered proprietor. On the 15th of October, 1836, a call was made for the amount of his shares, which he refused to pay, whereupon the present action was brought, to recover the principal and interest of the ten shares. The alleged abandonment of part of their original line by the company was the ground of defendant's refusal to pay the amount of his shares; but the jury found for the plaintiffs—Damages 53*l.* 16*s.*

Needles.—Messrs. Cocker and Son, of Sheffield, have obtained a patent for, and commenced working, a machine for making needles, which draws out the wire and straightens it, cuts it into the exact length, points it, grooves it, drills and counter sinks the eye, files off the rough edges, and finally drops the needle into a box, at the rate of forty needles a minute. The proprietors expect that fifty machines may be attended by five persons, and that these will produce *one million two hundred thousand needles per day.—Leeds Intelligencer.*

Patent Machine.—A patent machine has lately been set to work at Mr. Charles Todd's weaving factory, Hutchesontown, by Mr. George Smith, of Manchester, for the purpose of starching and drying warps—that is, preparing the threads for the weaver, which is now done by dressing machines. It is capable of thoroughly finishing about one hundred yards of warp in a minute, or six thousand yards an hour, each chain containing about two thousand threads. It is the first erected in Scotland; but they are already numerous and becoming universally adopted in England. —*Inverness Courier.*

Adventures of a Bale of Cotton.—A bale of cotton was shipped on board the Great Western, at New York, on the 6th of May, arrived in King-road on the 22d, was sent to the new cotton factory, at Bristol, on the 23d, and on the 24th, part of it manufactured into yarn, was exhibited, at a public meeting of the inhabitants, as a specimen of the first cotton ever manufactured in that city.

Zinc v. *Tin.*—Mr. Crawshay is said to have sold his extensive Tin Works at Trefforest, Newbridge, to a London Company, who have lately purchased the patent for covering iron plates with zinc instead of tin. Mr. Crawshay himself retains a considerable interest in the establishment, and is one of the directors: his son, Mr. Francis Crawshay, continues the principal manager. Some persons believe that the above patent will produce a complete revolution in the tin trade: time will show — *Gloucestershire Chronicle.*

Fires in London.—The total number of fires observed and reported by the police in 1836, was 240 exclusive of chimneys; in 1837 it was 220. Of these, 104 in the former year, and 59 in the latter, equal to 34 per cent. of the whole number, were extinguished by the police before the arrival of the engines. The estimated amount of loss, generally taken from the statements of the sufferers themselves, was 486,500*l.* in 1836, and 198,550*l.* in 1837. In the former sum is included 400,000*l.*, the estimated loss at the warehouses of Fenning and Co., near London-bridge; and in the latter 150,000*l.*, the loss at Davis's Wharf, at Shadwell. If these two sums be excluded, the loss in the two years amounts to 135,050*l.*—*Journal of the London Statistical Society.*

PARLIAMENTARY PROCEEDINGS.

House of Commons.—List of Petitions for Private Bills, and progress therein.

Those marked thus — are either withdrawn or rejected.

	Petition presented	Bill read first time.	Bill read second time.	Bill read third time.	Royal Assent.
Aberbrothwick Harbour	Feb. 12.	—	—	—	—
Anti Dry-rot Company	Dec. 7.	Feb. 26.	—	—	—
Ardrossan Railway	Feb. 16.	—	—	—	—
Belfast Waterworks	Dec. 21.	Apr. 6.	..	..	..
Birmingham Equitable Gas	Feb. 16.	Mar. 2.	—	—	—
Birmingham, Bristol, and Thames Junction Railway	Feb. 10.	Mar. 26.	May 15.	..	..
Birmingham and Derby Junction Railway	May 7.	May 25.	June 6.	..	..
Blackburn Gas	Feb. 14.	Mar. 8.	Mar. 22.	May 10.	..
Bolton and Preston Railway	Feb. 15.	Mar. 14.	April 30.	May 23.	..
Boughrood (Wye) Bridge	Feb. 11.	Mar. 26.	April 27.	May 21.	..
Brandling Junction Railway	Jan. 16.	Feb. 14.	Mar. 20.	Apr. 25.	..
Bristol and Exeter Railway	Feb. 12.	Mar. 21.	Apr. 3.	May 9.	..
Bury (Lancaster) Waterworks	Feb. 13.	Mar. 15.	Mar. 30.	May 21.	..
Bude Harbour	Mar. 30.	..	..	..	..
Cheltenham and Great Western Union Railway	Dec. 15.	Feb. 20.	Feb. 27.	Mar. 28	..
Cookham Bridge	Feb. 15.	Mar. 8.	Mar. 20.	Apr. 25.	..
Deal Pier	Feb. 16.	Mar. 26.	..	May 18.	..
Eastern Counties Railway	Jan. 25.	Feb. 26.	June 1.	..	..
Edinburgh and Glasgow Railway	Jan 25.	Mar. 2.	Mar. 13.	May 7.	..
Exeter Commercial Gas	Feb. 16.	Mar. 26.	April 27.	May 21.	..
Farringdon (London) Street	Feb. 5.	Mar. 26.	April 27.	June 15.	..
Fen Drayton (Cambridge) Enclosure	Feb. 14.	—	—	—	—
Fishguard Harbour	Feb. 9.	Feb. 23.	Mar. 12.	May 8.	..
Fleetwood Tontine	Feb. 15.	Mar. 26.	..	..	..
Garnkirk and Glasgow Railway	Feb. 13.	Mar. 26.	Apr. 25.	..	..
Glasgow Waterworks	Feb. 2.	Feb. 26.	Mar. 16.	June 11.	..
Grand Junction Railway	Feb. 12.	Mar. 8.	Mar. 29.	June 8.	..
Gravesend Cemetery	Feb. 14.	Mar. 21.	Apr. 3.	April 30.	..
Gravesend (No. 1) Pier	Jan. 25.	Feb. 7.	Feb. 26.	..	..
Gravesend (No. 2) Pier	Feb. 16.	Mar 26.	..	..	..
Great Central Irish Railway	Feb. 26.	Apr. 3.	..	..	.
Hartlepool Dock and Railway	Feb. 16.	Mar. 26.	May 8.	..	..
Herne Gas	Feb. 16.	Mar 26	..	..	..
Isle of Thanet Cemetery	Feb. 14.	Mar. 26.	May 31	June 21.	..
Lady Kirk and Norham (Tweed) Bridge	Feb. 16.	Mar 26	..	..	.
Leamington Priors Gas	Feb. 16.	Mar. 26	April 26.	June 11.	..
Leicester Gas	Feb. 16	Mar. 26.	April 30.	May 31.	..
London and Croydon (No. 1) Railway	Dec. 22.	Feb. 23.	Mar. 7.	April 4.	..
London and Croydon (No. 2) Railway	Dec. 22.	—	—	—	—
London and Greenwich Railway	Dec. 11.	Feb. 7	Feb. 20.	Mar. 21.	Apr. 11.
London Grand Junction Railway	Feb. 15.	Mar. 26.	April 26.	—	—
Londonderry Bridge	Nov. 27	Mar. 5.	April 30.	..	.
Manchester, Bolton, and Bury Canal, &c.	Jan. 23.	Feb. 19.	Mar. 8.	May 3.	.
Metropolitan Suspension Bridge	Feb. 16.	Mar. 26.	May 8.	June 15.	.
Midland Counties (Mountsorrel) Railway	Feb. 8.	Mar. 16.	Mar. 29.	May 23.	..
Montgomeryshire Western Branch Canal	Jan. 16.	Feb 27	—	—	—
Moy River (Ireland) Navigation	Feb. 13.	—	—	—	—
Necropolis Cemetery	Dec. 11.	Feb. 12.	Feb. 26.	..	..
Newcastle-upon-Tyne Railway	Dec. 4	Feb. 9.	Mar. 6.	May 3.	..
Newcastle-upon Tyne and North Shields Railway	Feb. 14.	—	—	—	—
Newquay (Cornwall) Harbour	Feb. 13.	Mar. 26.	May 3.	May 28.	..
Newtyle and Cupar Angus Railway	Feb. 13.	Mar. 26.	April 25.	..	..
Oldham Gas and Waterworks	Feb. 13.	Mar. 8.	April 2.	..	..
Oxford and Great Western Union Railway	Feb. 16.	Mar. 7.	Mar. 14.	June 8.	..
Paington Harbour	Dec. 7.	Dec. 22.	Jan. 16	Feb. 28.	Mar. 30
Portland Cemetery	Feb. 16.	—	—	—	—
Portsmouth Floating Bridge	Feb. 15.	Mar. 8.	Mar. 26.	April 27.	..
Rocester Bridge	Feb. 14.	Mar. 19.	April 3.	May 21.	..
Royal Exchange	May 25.	June 11.	June 21.	..	.
St. Helen's and Runcorn Gap Railway	Feb. 15.	Mar. 16.	Mar. 30.	April 27.	..
St. Philip (Bristol) Bridge	Feb. 16.	Mar. 26	May 10.	May 31.	..
Saltash Floating Bridge	Dec. 21.	—	—	—	—
Soane's Museum	Feb. 12.	—	—	—	—
Southampton Docks	Feb. 14.	Mar. 29.	May 7.	June 1.	..
Southampton Pier	Feb. 9.	Mar. 26.	May 4.	June 6.	..
Taw Vale (Devon) Railway and Dock	Feb. 15.	Mar. 12.	Mar. 26.	May 3.	..
Tenby Improvement and Harbour	Jan. 23.	Feb. 9.	Feb. 26.	Apr. 3.	.
Thames Improvement Company and Drainage Manure Association	Dec. 4.	Feb. 16.	..	..	..
Thames Purifying Company	Feb. 16.	—	—	—	—
Turton and Entwisle Reservoir	Feb. 13.	Mar. 8.	Mar. 21.	May 8.	..
Tyne Dock	Feb. 16.	—	—	—	—
West Durham Railway	Feb. 16.	—	—	—	—
West India Docks	Feb. 13.	Mar. 23.	Apr. 9.	April 30.	..
Westminster Improvement	..	..	..	..	..

STEAM NAVIGATION.

Log of the Great Western on the Voyage Home.—The Great Western on her return left New York on the 7th of May. The interest of the citizens was fully sustained to the last moment of her departure. Thirteen steamers started with her, and five of them accompanied her to the Hook. Their decks, the battery, and every point of view, were crowded with spectators, cheering, saluting, and waving flags, &c. We subjoin extracts from her homeward log:—

7th May.—W. 9 knots per hour.

8th May.—Light winds S. 6 knots, wind variable, N.E. Average rate this day, 9 knots. Lat. by observation 48 15 N.

9th May.—Wind light N.W. At 10½ the bearings got warm, stopped a quarter of an hour to cool. At 6 stopped ten minutes to tighten screw of connecting-rod, &c. Average rate this day 7 knots. Lat. 30 34 N.

10th May—Light winds S.W. Average 9 knots. Lat. 39 01 N.

11th May.—Light winds N.N.E., our course due E. At 7 stopped ten minutes to tighten screws. Average 9 knots. Lat. 39 48.

12th May.—N.W. Rate 9 knots. At 5½ exchanged colours with an American standing to westward. Strong wind and variable. Average 9 knots. Lat. 40 10.

13th May.—N.N.E. Rate 9 knots, strong wind and cloudy, with rain. Lat. 40 44 N.

14th May.—E.N.E. Rate 10 knots. Average 9¼ knots. Lat. 41 41.

15th May.—Wind variable, S.E. Rate 10 knots. Average 10. Lat. 43 02 N.

16th May.—Calm, E. 10 knots. At 8 A.M. passed a large ship to westward. Average 9¼. Lat. 44 16 N.

17th May.—S.W. Moderate weather. At 5½ stopped an hour to cool and repair engine crank. At 2½ stopped to right engine. At 3½ proceeded with one engine. Wind variable. Average 9 knots.

18th May.—Strong breeze. At 5 P.M. the brass work being repaired, stopped engine, and set off with both at 55 minutes past 5. Average 9½.

19th May.—Weather moderate, W. Average 9½.

20th and 21st May.—Average 9½.

22d May.—Let go anchor in the Severn at 10 P.M.

The Great Western brought 5,555 letters, and 1,760 newspapers; also a quantity of cotton for the Great Western Factory.—*Bristol Gazette.*

Another Steamer for New York.—The directors met on Tuesday, May 29, and it was unanimously resolved immediately to lay down another steam-ship for the American trade, of a larger tonnage than the Great Western.

Atlantic Steam Navigation.—We understand that the British and American Steam Navigation Company, owners of the splendid steam-ship British Queen, have contracted with our townsmen, Messrs. Fawcett and Co., for a pair of engines 78 inches diameter of cylinder, and seven feet stroke, for their second steam ship, to be called the President, a vessel of 1,800 tons measurement, building expressly for the Liverpool and New York trade, and that the manufacturers have undertaken to put these engines into operation before any others, for the New York line. There is therefore no doubt that the above spirited company will be the first to establish with a line of suitable packets, a regular steam communication with America; and their arrangements are so far advanced for building additional vessels, that there is every reason to suppose, in the course of next year, they will be able to fulfil the intentions expressed in their prospectus (published nearly three years ago), of sailing their packets from Liverpool and London to New York alternately, on the 1st and 16th of each month.—*Liverpool Standard.*

First Steam-Ship from Liverpool to New York.—We have great gratification in observing that Liverpool is not to be left behind Bristol in steam navigation so long as we had reason to apprehend. The spirited proprietors of that splendid vessel, the Royal William, which has performed so many successful voyages, invariably beating her Majesty's steam packets, is under appointment to cross the Atlantic, and will sail from Liverpool for New York on the 5th July.—*Liverpool Mail.*

The New Steamer "The Liverpool."—Great curiosity was lately excited in Dale-street by the passing of a lorry, drawn by five horses, which was laden with what we learned was a paddle-shaft for Sir John Tobin's new steamer "*The Liverpool,*" now lying in Trafalgar Dock. The shaft was of malleable iron, and weighed 6 tons 14 cwt. and 2 quarters, being the largest ever seen in Liverpool; when we observed it, it was being conveyed from the Mersey Steel and Iron Forge, to Messrs. Forrester and Co.'s engineering establishment in Vauxhall-road, where the engines for this gigantic steamer are being manufactured. Some conception may be formed of the steamer from the paddle and shaft in question, which was 23 feet in length, and 18½ inches in diameter; independent, therefore, of the connecting-shaft, the paddle-shafts alone are 46 feet in length; the engine itself struck us as being in size something approaching to that of a village church. We are informed that the engine is 460 horses power, and some single pieces of its machinery, alone, exceed 10 tons weight; a single crank weighs 25 cwt. This engine, and the vessel for which it is intended, are now objects of great curiosity, which has been much excited by the recent successful steam voyage to New York; they are the largest ever manufactured or built in this port.—*Liverpool Mail.*

Great Maritime Steam Projects.—The government has determined to support the communication with the East, by the way of the Mediterranean, Cairo, Cossein, and the Red Sea. But no energy and devotedness, backed even by the wealth of the East, will with the present machinery, which is behind the age, stem the opposing monsoons. It is however as we will show, to be accomplished. It is cruel to exhaust the minds, the thews and sinews of such men as Chesney and Waghorn, and many more, by a pertinacious adherence to antiquated and imperfect systems, solemnly maintained by the assumptive cautiousness of pretended wisdom. The voyage to Alexandria may be expensively performed by boats of the common construction. The monsoons are to be met and overcome, the short head seas to be ploughed through, and the passage made, unerringly, by the means of high-pressure steam only (the safest by far). The other way to India has been determined on. The Azores will be the station between England and the islands of the West Indies. The Portuguese will lease the island required, to the spirited merchants who have commenced the scheme, and there a change will take place of the boats and goods. Perhaps that is not judicious, as it must occupy time, and increase expense, merely to load a different quality of boat. From the Azores, the boats will proceed to the Windward and Leeward Islands; while others go through the river San Juan, from which the obstructions which are few and inconsiderable will be removed, and wend their way through the great lake Nicaragua to the lake, Leon, and thence to Lema in the Pacific, and from thence hasten on to Canton, India, and Australia. Such a line of transit must accelerate the peopling of that fine region which encompasses the lakes, facilitate intercourse with our Eastern and Australian possessions, add value and security to our western colonies, and disperse knowledge, religion, and industry over countries now the haunts of the beasts that graze [illegible]. Another set of men have been carefully building up an undertaking so [illegible] just that it deserves what it will reap—a great reward. They have determined to follow out the plan of that able man, Lord William Bentinck, and establish steam-boats on the great rivers of India, that they may be traversed with the same facility as the rivers of North America. The East India Company, after [illegible] navigation, will not only transfer the boats they have on the Ganges to this company, but afford them their countenance. With liberality, and on principles of sound policy, the natives are to constitute a part of the Indian Directory. The project has been met with open arms by the native and European residents, and we shall soon see the Ganges, the Bramahpootra, and, hereafter, the Indus, transmitting their productions in return for ours; and their thickly-peopled provinces, holding intercourse with realms now almost unknown to them, from the expense and difficulty of travelling. This was a debt due to our vast Eastern dominions. We have before us returns of the numbers who have traversed the Ganges in steam-boats already there, and the accounts of the great demand for transit; and can only say, that the numbers are so great, the amount of produce so much beyond what is generally supposed, that with common prudence the projectors must be enriched, and India greatly benefitted. We understand that the managers intend to avail themselves of all that science can produce, and to combine, at once, the greatest safety and the greatest power. Lord William Bentinck directed that all political correspondence should be carried on in the English tongue. It has led to the establishment of thirty seven colleges or seminaries for the study of the English language,—a matter of state importance; the intercourse being so facilitated, must lead to a wider diffusion of our tongue, and with it its literature and science. If we continue thus to liquidate our debt to India, both will find their reward. Another body of men have a lease, for fifty years, of the Rio Doce in South America, and the exclusive right of navigating that river, which leads from between Rio and the Equator, beyond the Minaes Geraes, into the very heart of the Brazils; so that the commodities of England will be taken by steam craft to the very doors of the inhabitants of the most populous and the richest districts, through regions yet unreclaimed, and where yet the naked savage wanders. The route has been surveyed by the direction of the company. Iron boats are already gone out, with saw mills and other machinery; and an iron steam-boat of 300 tons, is now building, to proceed to that river, and commence the trade. The banks are to receive settlers, and there is every probability of sources of comfort and wealth being opened, which must accelerate the march of civilization, and most probably, sow the seeds of industry and religion in realms where the rarest productions of the tropics spring up, fade, and fall, because there are none to gather.—*British and Foreign Review.*

On Steam Navigation to India: Letter from "Nautilus" to the Editor of the Shipping Gazette.—It is now twelve years since a communication was first effected with India by means of steam. The barque Falcon, which had been previously a yacht belonging to the Hon. Mr. Pelham, now Lord Yarborough, was furnished with paddles and equipped with steam apparatus, destined to enterprise a voyage over the mighty abyss of the Pacific Ocean. Not having been constructed on the same principle as steamers usually are, flat bottomed, she drew her proportionate depth of water, and was as well calculated for going under sailing courses as under the propelling influence of steam; so that she could be considered as having only partially steamed her way out to India. On her arrival at Calcutta she was bought up by the government, her engines were withdrawn, and she was retained as an opium trader between that port and China. The next steamer that came out to India was constructed on the regular plan; she was named the Enterprise, and was commanded by Captain Johnson, R.N. She coasted her route outward, hugging the African shores, touching at the Cape of Good Hope for coals, and reached Calcutta in little better than three months. The sensation produced among the natives on her buffeting her course up a strong ebb tide, in the Hooghly river, her funnel throwing out volumes of smoke, and her paddles re-echoing with crashing reverberations, can be more easily conceived than expressed. It produced a supernatural effect on the credulous children of "Vishnu." This fine vessel of 500 tons was also bought up by the Bengal government, for the purpose of conveying military stores from Calcutta to Rangoon during the Burmese war, in which unfavourable campaign her services were found invaluable. Since that period a dozen or more of steam-vessels of different registers have been constructed in Calcutta, and supplied with engines and apparatus from this country, which trade between the sister presidencies, China, and the Eastern Archipelago. But the most grand undertaking that can be considered under this head, is the steam navigation from Bombay to Suez, as the means of affording a more ready intercommunication between India and this country, which was first performed by the Hugh Lindsay steamer, conveying passengers and packets, about three years ago. The overland course of communication between Suez and the Red Sea was expected to have been attended with many obstacles. It was first contemplated to sink a canal as a connecting gut between the straits of Babel-mandel and the Red Sea; but the sands when agitated by the "kansim" of the desert, it was well considered, would choke up the channel, and render it unnavigable. A railroad was also projected, but then, again, the sand would afford no foundation for such a superstructure; so that the only alternative that remained was to travel over the intervening sandy tracks of desert in caravans. There was another attempt made by Colonel Chesney to communicate with the Red Sea by way of the Euphrates, but the opposition of the north-west monsoons, owing to the torrent floods, rendered the trial abortive. The Tigris was lost in this expedition, so that the only communication between England and India by steam, remains precisely as it began three years ago. Nor indeed is it likely to be improved as to facility of intercourse, though it may be carried on upon, a more extensive scale, so long as the Isthmus of Suez interposes between the two maritime ports. Could the Isthmus be disposed of, or rendered available for the expeditious traffic of large freights, then indeed would the advantages prove incalculably great; but, at present, there appears no more advantageous mode of intercommunication between this country and India than that of the common maritime one, unless steam-vessels of large dimensions were purposely fitted up for that purpose, which even then, when stowage room for coal is considered, would scarcely answer for the reception of large cargo or freight.

Paddle Wheels Exploded.—The latest improvements in Steam Navigation is the patent propeller; it is intended to supersede the use of paddles and paddle-boxes, the unsightly appearance of which is not greater than their practical evils. They are much in the way, and impede the vessel's progress by the resistance they offer.

both to the wind and water. Notwithstanding all the improvements made in them, it has not yet been found practicable to prevent their causing great agitation in the water, nor to work them so as not to waste much of the steam power. The propeller has all the utility and force of the paddle, with none of its disadvantages. It consists, according to the description of the patentee, of an Archimedean screw, and is fixed in the dead wood or run of the vessel. The vessel is shaped and rigged like other sailing vessels, so that the propeller may be used singly, or in conjunction with sails, or not at all, without impeding the sailing, as the propeller may be unshipped at pleasure. Hence the vessel is not solely dependent either on wind or fuel; and long voyages may be performed with great saving, and as the strain of the vessel (so destructive to common steamers) from the engines is much less, so is the wear and tear also. If armed steamers come into use, its application must be invaluable. The arrangement of the engines being fore and aft, gives space on the sides for the introduction of materials for their protection, and the propeller is, from its position, free from gun-shot. In rivers it creates no swell, so frequently productive of loss of property and life. In canals its application would cause no injury to the banks, and the stowage-room is increased by greater breadth of beam. To prove this, an experimental schooner of thirty-four feet has been already built, and fairly tried, both on the river Thames and the sea, with astonishing success. Hundreds have witnessed it, and the pilots of Gravesend and Folkestone can bear testimony to its excellency. The Lords of the Admiralty and several scientific gentlemen have witnessed the performance of this little boat, and have expressed their admiration. She is only thirty-four feet long, six feet six inches broad, and measures six tons. She is so small that her topmasts passed with ease under the paddle-boxes of the British Queen, under one of which she could lie with ease. Yet this tiny vessel—the very smallest steamer, perhaps, in use in the world—towed this great ship up the river, and into the City Canal, to the astonishment, as the papers of the day remarked, of thousands of spectators. If this useful invention realise all which the patentee promises—and we see no reason to mistrust his theory or doubt his experiment—it will be as great an improvement in navigation as the first moving of vessels with paddle-wheels.—*Daily Paper.*

Saint Sebastian Steamer.—On Saturday, the 9th ult., a new steam-vessel was launched from the dockyard of Messrs. Thomas and William Wilson, the builders of most of the boats employed by the City of Dublin Company, and well known for the perfection of their work. This vessel is the first of a line of packets which are to leave Rio de Janeiro twice in the month, with mails and passengers for the ports of Bahia, Parragua, Pernambuco, Ceara, Maranham, and Para, and is called "The Saint Sebastian," in compliment to the city of Saint Sebastian, off Rio de Janeiro.—*Liverpool Mail.*

The Gorgon Steam Frigate.—This vessel, which is the largest and most powerful steam ship belonging to the British service, is just completed. On Thursday, the 14th ult., the engines, which have been made, completed, and fixed on board the vessel in little more than eight months, were set to work for the first time, and acted in the most efficient and satisfactory manner. The tonnage of the Gorgon, according to the old mode of computation, is 1,150 tons; the length of the deck is 183 feet; breadth between the paddle-wheels, 37 feet 6 inches; full breadth of deck, 45 feet. This vessel was built in the dockyard of Pembroke, from the designs of Sir William Symonds, the surveyor-general of the navy, and for her excellent properties as a steam-vessel of war, for her strength, symmetry, and durability, is unrivalled by any vessel in the British or any other navy. She combines also, in a most eminent degree, the necessary qualities of a sailing-vessel with those of a steam-ship. The Gorgon will be fitted with sixteen 32-pounders (long-guns), of which twelve will be on the gun-deck and four on the upper deck. She will also be provided with two of those newly-invented tremendous engines of war, the 10-inch guns, intended to propel hollow shot of 96lbs. weight; one of these guns will be placed forward, and the other aft, on the upper deck, on sliding swivel beds, which will range entirely round the horizon. The bulwarks all round are so constructed that they can be thrown down in a moment to admit the guns being pointed in any direction. The gun-deck of the vessel is fitted up in the most commodious manner for the accommodation of the officers and crew, amounting altogether, with engineers, in war time, to 190 men. The orlop deck, fore and aft, is appropriated entirely for the reception of troops, with their stores and baggage; and the ample hold will receive abundance of water, provisions, and stores for a long voyage. The steam engines for propelling this magnificent vessel are of 320 horses' power; that is, two engines, each of 160 horses' power. They are made by Messrs. John Seaward and Co., of the Canal Iron Works, Limehouse, and are of a very novel construction, being remarkable for their compactness, strength, and lightness. There are four copper boilers for supplying steam to the engines. They are quite detached from each other, and can be used separately or in conjunction, as may be required. This is an important convenience, as it admits of repairs being made to one or two boilers while the others are in use.—*Morning Chronicle.*

Steam to China.—The rage for steam intercourse to all parts of the world is now carried to such a pitch, that we find in the American papers steam vessels advertised to proceed to China.—*Wexford Independent.*

Steam Communication with Ireland.—Steam-boats have done more to cement the union between England and Ireland than all the acts of parliament which have passed since the reign of the second Henry. Agricultural industry in the sister kingdom has received an extraordinary impulse from the opening of new and steady markets, where demand increases faster than supply. The total value of live animals imported from Ireland at Liverpool alone, during the year 1837, amounted to nearly four millions sterling; and the importations to Bristol are scarcely inferior. Mr. Porter, in his "Progress of the Nation," says that the value in money of one seemingly unimportant article, eggs, taken in the course of the year to the above two ports from Ireland, amounts at least to 100,000*l.* The progress of this trade affords a curious illustration of the advantage of commercial localities in stimulating production and equalising prices. Before the establishment of steam-vessels, the market at Cork was most irregularly supplied with eggs from the surrounding district; at certain seasons they were exceedingly abundant and cheap; but these seasons were sure to be followed by periods of scarcity and high prices, and at times it is said to have been difficult to purchase eggs at any price in the market. At the first opening of the improved channel for conveyance to England, the residents at Cork had to complain of the constant high price of this and other articles of farm produce; but as a more extensive market was now permanently open to them, the farmers gave their attention to the rearing and keeping of poultry, and, at the present time, eggs are procurable at all seasons in the market at Cork; not, it is true, at the extremely low rate at which they could formerly be sometimes bought, but still at much less than the average price of the year. A like result has followed the introduction of this great improvement in regard to the supply and cost of various articles of produce. In the apparently unimportant article feathers, it may be stated, on the respectable authority above quoted, that the yearly importation into England from Ireland reaches the amount of 500,000*l.*—*Manchester Guardian.*

Fatal explosions on board the Victoria, Hull steam-ship, and the James Gallacher of Glasgow.—It is with much regret that we have to record another disaster as having happened to that ill-fated vessel the Victoria. On Thursday afternoon, the 14th ult., having nearly finished her voyage from Hull, she ran foul of a collier brig off the lower tier Ratcliff-cross. Both vessels were injured by the shock; the engines of the Victoria were instantly stopped, and in about three minutes one of the boilers exploded with great violence. Several of the men employed about the engines and boilers were killed on the spot; five in the whole were reported as dead the next day; and the latest accounts state that two more have died of the injuries received, besides two others seriously injured. Of eighty passengers, none were materially hurt; one lady only receiving an alarming shock from terror excited by the explosion. Several of the passengers have come forward to acquit the captain of all blame, especially of all design of racing with the rival ship Wilberforce which was within sight during the whole voyage.

On Saturday the 16th ult. an inquest was held on the bodies of the sufferers, and the jury personally examined the boilers. The inquiry was adjourned to Tuesday June 26th with a view of obtaining further evidence, particularly from the surviving but injured engine-men. We shall recur to the subject when the further proceedings and the verdict are reported; meanwhile we give a few of the facts which have been already elicited. And first, the boilers appear to be the same which were originally in use, but repaired since the accident of March 16. In our account of the inquest on that occasion, p. 174, some particulars of their construction will be found. It seems that on the voyage, great difficulty was experienced in getting the steam up; and on the inquest it was suggested that the men had cut off the supply of water in order to effect this object the sooner, and thus caused the accident. This however was strenuously denied by the second engineer, lying on what was expected to be his death-bed. The jury found by the personal examination of one of their number, an engineer, that a rent twelve inches long had been made at the extreme end of the furnace near the flue. The lower part of the boiler was forced outwards and the upper part inwards. From the present state of the bands, it appeared as if the supply of water by the feed pipes was nearly cut off. The jury expressed much surprise at the inconveniently small size of the stoke holes, and wondered how the men could manage the fires in so small a space.

Thursday the 14th ult. was the date also of the other accident which is mentioned in the heading of this article. It occurred at the Railway Wharf near Renfrew, where the James Gallacher had stopped to land passengers. Several lives were lost in this case also; and amongst them, those of some of the passengers. The cause of the accident has not been ascertained

Deeply regretting as we do these lamentable occurrences, we are not inclined on account of them to suppose that the average amount of danger in steam navigation is increasing, as some appear to imagine. For we remember that our steam marine is increasing beyond all precedent;—far beyond the increase of accidents we firmly believe. Still shall we look, not despondingly, but with strict scrutiny, into the causes of such accidents as do occur, and wherever they are traced to faulty construction or negligent working of the machinery, we shall not be tardy in contributing to the torrent of groans which public indignation will pour out upon the guilty. Our Coroner's juries are daily becoming more and more important as courts of inquiry into accidents: we trust to them confidently, to examine carefully, availing themselves of the best professional aid; to judge impartially; to acquit where there is no blame; but heavily to visit those with punishment, whose carelessness or avarice may at any time endanger the safety of their fellow-men.

PROGRESS OF RAILWAYS.

Midland Counties Railway.—There are now upwards of 1,500 men employed on the railway between this town and Rugby, and that number is being gradually increased. A vast number are also employed between Leicester and Loughborough.—*Leicester Mercury.*

Preston and Wyre Railway.—We are happy to be enabled to report that the works on this line of railway are proceeding with great spirit. Of the first contract, from Bourne Naze to Weeton, a distance of eight miles, nearly seven miles have been completed, with the exception of the permanent way, which is now in active progress. On the remaining portion of this contract which is still incomplete, there are about 350 men and between 60 and 70 horses engaged by day and night, and its completion by the early part of autumn is now rendered a matter of certainty. A contract has also been concluded with Mr. Stanton for the whole of the remaining portion of the line from Weeton to its entrance into Preston at Tulketh Brow, a further distance of nine miles, which is to be commenced in the course of the ensuing week. The whole line, therefore, from Bourne Naze on Wyre, to Preston, is now under contract. A fine locomotive engine, of superior construction, was placed upon the railway during the past week, to be employed in conveying ballast and soil between Poulton and Fleetwood.—*Preston Pilot, June 2.*

Lancaster and Preston Junction Railway.—The works belonging to the Lancaster end of this line are proceeding with great activity.

The Manchester and Bolton Railway was opened on Thursday, May 31.

Manchester and Bolton Railway.—We noticed on Saturday, the 9th ult., the numbers of persons conveyed by this railway to and from Agecroft bridge, from this end of the line, during three of the race days. We have since been informed that no fewer than fifteen thousand persons were conveyed to and from the station at Agecroft bridge, during the four race days; and that the transit of this great number of individuals, at a time when, especially in the evenings, there was much intoxication, was effected without the least personal injury being sustained by any one. This was no doubt owing, in a great measure, to the judicious regulation of the railway company, and partly to the prompt and efficient assistance rendered by those officers of the Salford police who were stationed at this end of the line to keep order, a duty which they are stated to have very zealously discharged. The Bolton authorities no less than those of Salford, directed the services of their police to be available on the occasion; and thus, at both ends of the line, notwithstanding the great influx of passengers, confusion and its probable result—accidents—were avoided. The introduction on the line, on Monday the 11th, of open carriages in each train at a lower rate of fare, has been productive of a considerable increase in the number of pas-

sengers during the two following days, the total number averaging eight hundred each day.—*Manchester Guardian.*

Opening of the Newcastle and Carlisle Railway.—Monday, June 26, is fixed for the opening of the whole of this important line of railway between the eastern and western seas. Portions at each end of the line have been in full and successful operation for some time. The middle portion, connecting the two ends, is now completed. The distance (60 miles), it is expected, will be performed in about three hours.

Blackwall Railway.—The first portion of this railway, commencing at the South West corner of Chamber Street Whitechapel and Goodman's Fields, and terminating at the West side of George Street, near White Horse Street Stepney, being a distance of 1 mile and 540 yards, was contracted for on the 19th ultimo. Messrs. George Stephenson and Bidder are the Engineers, and Messrs. Webb the Contractors; there were three other parties tendered. The amount of the Contract is under 60,000*l.* The works comprise the construction of the Viaduct, consisting of 182 arches, varying from 20 to 30 feet span, and 21 Bridges—the latter are principally of Iron. The works are to commence within one month from the date of the Contract, and be completed in 15 months.

Fiddler's Ferry Railway Bill.—The Grand Junction Railway Company, who were the promoters of this bill, have suffered a parliamentary defeat. An adverse division took place in committee, on Tuesday, May 29, the majority 21, and the minority 20; which has led to its abandonment, and under circumstances which, we apprehend, will preclude it from being again brought forward.—*Liverpool Albion.*

Midland Railway.—At recent meetings of the Royal Burgh of Peebles, and of the magistrates and council of the same, it was resolved to use the utmost exertions to promote the carrying into effect of the Newcastle, Edinburgh, and Glasgow Railway, by the Midland line.—*Newcastle Journal.*

Great North of England Railway.—The first stone of the intended Tees Bridge, on the line of this railway, was laid on Tuesday May 22, in the presence of G. H. Wilkinson, Esq., of Harperley Park, chairman of the directors, and the members of the board. The design after which the bridge will be built is of a remarkably chaste and elegant character, and was prepared by Henry Welch, Esq., civil engineer, of Newcastle. The bridge is to be of freestone, and will consist of four arches of sixty feet span each on the oblique line, crossing the river at an acute angle. This circumstance, combined with the extent of the arches, and the materials to be employed, will render this beautiful structure perfectly unique; and it cannot fail, when completed, to reflect the highest credit on the skill and boldness of the architect, and afford a striking illustration of the advancement of science, which can thus triumph over the obstacles of nature, and at the same time pursue the praiseworthy objects of commercial enterprise.—*Durham Advertiser.*

The York and North Midland Railway.—We believe the public generally do not perfectly understand the different lines of railway to which the "York and North Midland" will be united, or of which it will form a continuation. First it connects itself with the Leeds and Selby at Milford; and by using the latter line about five miles, you reach Selby, and will be able to proceed forward to Hull by the Hull and Selby line, which latter place you will arrive at in about two hours from leaving York. At Methley, near Leeds, it joins the North Midland and Leeds and Manchester Railways: by means of the former you will be able either to proceed to Leeds, or travel south to London, Birmingham, Sheffield, &c.; or by the latter to Manchester, Liverpool, &c. &c. And, therefore, all travellers who have occasion to visit York from east, west, or south, can, and most probably will, do so by "the York and North Midland Railway." At this city it also forms a junction with the Great North of England Railway to Newcastle; therefore the only public road of any consequence by which travellers will be deprived of this privilege, will be from Malton, Whitby, and Scarborough. It ought also to be understood that all the traffic on the Manchester and Leeds Railway, going to Hull, which is calculated to be very considerable, will have to travel about seven miles on the York and North Midland line, viz., from the junction at Methley to Milford. We also understand the directors fully calculate on receiving on this part of the line a considerable portion of the present traffic between Leeds and Selby.—*York Chronicle.*

Hull Mail to London.—The directors of the Chamber of Commerce, having called the attention of our members to the application recently made to the Postmaster-General, to expedite as soon as practicable, the Hull mail by the Birmingham Railway, as far as Denbigh hall, &c., and to the reply they had received to that application, from the Postmaster-General; Mr. Hutt has written to Mr. J. Foster, the secretary, that—"At present there is some doubt if the post-office authorities have the power to transmit the mails by railway conveyance, to do away with which a bill has been introduced this session giving a special authority to do so. The bill will be read a first time this day. I understand that no arrangements for the transmission of mails by railway communication will be undertaken by the post-office, till after the bill in question has received legislative sanction. My attention shall be kept to the subject of your letter, and as soon as a proper occasion is afforded, I will call Lord Lichfield's attention to it also. As soon as the bill is printed, I will take care to forward a copy to you."—*Hull Observer.*

The general rate of travelling of the first class coaches on the Liverpool and Manchester railway is now 30 miles an hour; and within the last fortnight the whole 30 miles have been performed in 47 minutes.—*Caledonian Mercury, May 31.*

Railway Fares.—It appears from a statement made in the *Globe*, that whilst the cost of conveyance on the Brussels and Antwerp Railway is only one shilling, the cost of conveyance the same distance on the Liverpool and Manchester line is 6*s.* 4*d.*; on the Grand Junction 6*s.* 6*d.*; and on the London and Birmingham 7*s.*

IRISH RAILWAYS.

[Under this head, we gave in our last number, p. 231, a list of proposed railways furnished by an eminent engineer on whose information we thought, and still think it safe to rely. A correspondent has however supplied us with the following list as more accurate; and we insert it willingly, as our only object is to give our readers full and accurate information. To the last head of the present list, the lines laid down under the direction of the Royal Commissioners, we would direct particular attention, as we have reason to think that our present correspondent has on this subject good means of information.]

RAILWAY COMPLETED.

Dublin and Kingstown - - - - - - Engineer, C. Vignoles Esq.

RAILWAYS IN PROGRESS.

That portion of the Ulster Railway lying between Belfast and Lisburn (distance 8 miles) - - Engineer, G. Stephenson Esq.
Belfast and Cave Hill, commenced but stopped some years ago - - - - - - - - Engineer, W. Bald Esq.

RAILWAYS FOR WHICH ACTS HAVE BEEN OBTAINED.

Cork and Passage - - - - - Engineer, C. Vignoles Esq.
Great Leinster and Munster, or Dublin and Kilkenny - - - - - - - " John Macneill and David Aher Esq.
Dundalk Western - - - - - - " John Macneill Esq.
Dublin and Drogheda - - - - - - " W. Cubitt Esq.
Resident Engineer, G. Woodhouse Esq.

RAILWAY PROPOSED.

Great Central - - - - - - - - Engineer, C. Vignoles Esq.

LINES OF RAILWAY LAID OUT UNDER THE DIRECTION OF THE ROYAL COMMISSIONERS FOR RAILWAYS IN IRELAND.

South and South-western districts.

Dublin to Cork
" Kilkenny
" Limerick
" Berehaven
} Engineer, C. Vignoles, Esq.

North and North-western districts.

Dublin to Armagh
" Enniskillen
} Engineer, J. Macneill Esq.

ENGINEERING WORKS.

River Clyde Improvements.—At no port in the kingdom have such splendid and useful improvements taken place as upon the Clyde, within the last two years. The harbour upon the south side has been proceeded with nearly as far as Springfield works, and the dredging machine has been for some time in constant employment on that side, deepening the bed of the river. Vessels of the largest description that arrive are now stationed there, as a more commodious place for landing goods than on the north. A number of new sheds is at present in course of erection, and three large powerful cranes are daily in operation. But Springfield works seem, for a time, to be the *ne plus ultra* there; and it is much to be regretted that it should be so. Many of the low flat houses by Clyde-place, along the river, formerly occupied by private families, have this year been converted into elegant shops, and vacancies in the streets are fast filling up. The number of steamers is monthly upon the increase. Launches are frequent; and, in the different building yards, all hands are in full employ. Indeed, the traffic upon the river never at any time equalled what it is at present; for, independently of daily arrivals from England and Ireland scarcely a single day passes without a visit from foreign parts. Ere long there will be no necessity for unloading at Greenock, as the largest vessels will find ample harbour room at the Broomielaw.—*Glasgow Herald.*

Rye Harbour.—A meeting of the commissioners of Rye Harbour was held on the 31st of May, at which resolutions were passed to authorise the erection of "a wharf or stages" for the peculiar accommodation of the steam packets about to run between the port of Rye and Boulogne.

Deptford Pier and Junction Railway.—A proposition has been made to purchase this pier and railway to unite with the steam docks, and to commence immediately the excavating for that purpose.

Port Glasgow Harbour.—At a meeting held in the Council Chamber on Thursday the 11th ult., it was agreed that the trust should borrow 4,000*l.*; 3,000*l.* to be expended on necessary improvements at the harbour, but the corporation of Glasgow to be in no way implicated in the debt.

Projected Docks at Sunderland.—The project of constructing docks on the south side of the river Wear at Sunderland is again revived. The scheme at present in view is comparatively limited: it is to make a dock of an area of about three acres, sufficient to accommodate about 35 vessels of the largest size. This resolution has been taken by the advice of two eminent civil engineers, Messrs. Rennie and Walker, together with that of Mr. J. Murray, engineer to the commissioners of the river Wear. The expense is estimated at 45,000*l.*, which it is proposed to raise in 900 shares of 50*l.* each.

Scottish Trigonometrical Survey.—This important undertaking will be shortly commenced, and some officers of engineers have got an order of readiness for this duty.—*Edinburgh Observer.*

NEW CHURCHES.

Plymouth and Falmouth.—New Episcopalian chapels are likely to be built at each of these towns; Mr. Wightwick, Architect, having been applied to by the Reverend Incumbents of livings in each to furnish the requisite designs.

Buckleigh, Devon.—A new body is being supplied to the old tower of the church, under the direction of Charles Fowler, Esq., Architect, of London.

Crediton, Devon.—The church in this town is a singularly fine old edifice, having been once the cathedral of the Western See. Mr. Wightwick is at present engaged in refitting and improving it.

Helleston, Cornwall.—This church is undergoing repairs and improvements, under the care of Mr. Wightwick.

New Church at Holme Bridge, in Almondbury.—On Monday, May 28, the foundation stone was laid for a new church in the above parish.—*Leeds Intelligencer.*

PUBLIC BUILDINGS AND IMPROVEMENTS.

Plymouth.—The public hospital erecting under the superintendence of Mr. Wightwick, is nearly completed, and will shortly be opened for the reception of the invalid poor of South Devon and East Cornwall.

Among the more recent and distinguished of the many improvements which have been for some time carrying on in the same town, is the extensive shop of Messrs. Dabb and Co., Mercers and Drapers; the front extends nearly 80 ft., and emulates in its display of architectural decoration and its splendour of plate glass, the leading shops of the Metropolis. Of this also Mr. Wightwick was the architect.

Ludlow New Public Rooms.—On Saturday, May 26, the Committee of Management appointed to superintend the affairs connected with the new building in Ludlow, met pursuant to notice, for the purpose of finally concluding upon the terms of the contract with the builders, Miss Smith and Mr. Robert Atkins.

The Nelson Monument.—On Saturday, the 16th ult., a meeting of noblemen and gentlemen of the highest respectability took place at the Freemasons' Hall, for the purpose of taking into consideration the best means to be adopted for commemorating the splendid achievements of the late Admiral Nelson. The Duke of Buccleugh presided on the occasion, and was supported by the Duke of Wellington, the Marquis of Anglesea, Lord Lynedoch, Lord Melville, Earl Cadogan; Sirs E. Codrington, George Cockburn, T. Hardy, Richard Vivian, R. Inglis, the Chancellor of the Exchequer, &c. &c. The noble chairman briefly addressed the meeting, and entered into an outline of the objects for which they had been called together. He could not help remarking on the singularity of the fact, that so long a period had been allowed to elapse without any testimonial in celebration of the splendid victories of Lord Nelson having been erected. That fact however having pressed itself on the minds of many distinguished men, had led to the present meeting. The meeting was in the course of the day addressed by Sir E. Codrington, Lord Lynedoch, the Chancellor of the Exchequer, the Duke of Wellington, the Marquis of Anglesea, and others, by whom a series of resolutions was submitted, conveying a strong expression of the warm feeling which pervaded the breasts of those assembled in favour of the proposed object, and their high approval of the site of Trafalgar square, which had been granted by her Majesty's government. A list of donations was received. It contained the names of the Queen for 500*l.*, the Queen Dowager for 200*l.*, the Dukes of Wellington and Buccleugh 200*l.* each, and many others for sums varying in amount.

Wellington Testimonial.—On Monday, May 28, the Wellington Committee met, his Grace the Duke of Wellington in the Chair. With her Majesty's gracious permission, it was resolved to erect an equestrian statue on the arch on Constitution-hill in the Green-park. It is stated that the Wellington statue in the city is to be ten feet high; and the sum in hand for the work, to be about 8,000*l.* Sir J. Chantrey is expected to commence the work immediately.

Monument at Glasgow to Sir Walter Scott.—On Wednesday, May 30, the statue of Sir Walter, executed by Mr. John Ritchie of Musselburgh, arrived. It weighs nearly three tons, is in four pieces, and when put together will stand about ten feet and a half high. The likeness, we are glad to say, is exceedingly good, and the drapery is well executed.—*Glasgow Herald.*

Monument to the late Duke of Gordon.—The sum intended for erecting a monument to the memory of the late Duke of Gordon, in the county of Elgin, is completed, and contractors are wanted for carrying on the structure. This will be the first of the series of monuments to be erected in the Northern counties, in memory of the late Duke.—*Inverness Courier*, May 30.

FOREIGN INTELLIGENCE.

French Railroads.—Towards the close of the sitting of the Chamber of Deputies on Saturday, May 26, the Minister of Commerce brought forward the long expected bills for granting to private companies the authorisation necessary to construct two railroads between Paris, Dieppe, and Havre, by the *plateaux*, and between Paris and Orleans, through Estampes. The clause of the bills precluding all competition during 28 years for the former, and during 25 years for the latter, excited loud murmurs in the assembly. No other railroads can even be established between Paris and any of the intermediate points during those intervals. Some angry observations were subsequently exchanged between Messrs. de Tracy, Martin (du Nord), Lafitte, and Odillon Barrot, respecting the preference given by the Ministry to the company of the *plateaux* over that of the valley of the Seine, and the refusal of Government to authorise the construction of the railroad between Paris and Tours, because in all probability they were to be undertaken by M. Lafitte.

In the Chamber of Deputies on Monday, May 28, the sum of 7,000*l.* was voted in various shapes and forms as encouragements to commerce and manufactures. This the Deputies seem to regard as a princely sum, and make as much fuss about its division as if it were one hundred times the amount. The French government then brought forward its bill for ensuring to the revenue one-tenth of all the sums paid by travellers for their places in carriages on railroads. The commission proposed to exempt for ten years all railroads from the payment of this tax; but the Minister of Finance exclaimed that the revenue of the country could not possibly afford such a deduction, and the Treasury triumphed. One-tenth, not of the net profits, but one-tenth of the receipts is to be taken by the government; and for what? For making, repairing, watching, lighting, paving, or even cleansing the roads? Certainly not. The government is not to contribute to the extent of even one centime to all these expenses, and yet one-tenth of the gross receipts is to be deducted by it. Thus, whilst with one hand the sum of 7,000*l.* is voted to encourage the commerce and manufactures of France, with the other hand one hundred times that amount will, in a few years, be annually taken away by this most terrible tax of one-tenth on iron railways.

On Friday, the 15th ult., the Chamber of Deputies commenced the discussion, and adopted the principal dispositions of the bill for the projected railroad from Paris to Rouen, Havre, and Dieppe (by the *plateaux*), with a branch line on Elbeuf and Louviers. The debate on the measure continued and terminated on Saturday, with the adoption of the bill by a majority of 241 to 52. After the vote on the Paris and Havre Railroad Bill, the chamber commenced the discussion of the bill for conceding the execution of the Paris and Orleans line to Messrs. Casimir Leconte and Co., and up to post hour had adopted the first article, which grants the undertaking to those contractors.—*Shipping Gazette*, June 18.

Railroad from Paris to Belgium.—This railroad excites public attention to the highest degree in the departments of the Oise, Somme, Bas de-Calais, and Nord. The municipal councils of Amiens and Arras have decided that these towns should have an interest in the railroad, the first for 1,000,000 and the second for 500,000 francs; and we understand that the municipal council of Beauvais has adopted a similar resolution.

French Companies.—In one of the French papers lately received, there appears a curious notice about the public companies, for which there has lately been, and indeed is now such a fever in Paris. From this statement it results that in the first two months of this year 67 companies *en commandite* had been registered at the Tribunal of Commerce, with an aggregate capital of 118,022,000 francs, divided into 219,212 shares. Those declared in March, exceeded, however, that of the former two months together in respect of the nominal capital to be employed, the number of shares created being 399,035, with a capital of 274,472,000f. Amongst the associations thus started, the following may be cited as the most considerable:—One for the "mobilisation of the soil of France," with a nominal fund of 10,000,000f.; the Omnium Bank, with 25,000,000f.; Maritime Agency and Transport Service, with 10,000,000f.; Hackney Coach Company, with [illegible]0,000,000f.; Colonization of Algiers, with 6,000,000f.; Bank of Mobilisation and Mortgage Credit Guarantee, with 20,000,000f.; French Bank, with 30,000,000f.; Bank of Industry and Credit, with 5,000,000f.; the Provoyante, an insurance funeral company, with 6,000,000f.; the Financial and Commercial Bank, with 150,000,000f. The total number of companies established since 1826 is stated at 1,106, thus classed:—For periodical publications and bookselling speculations, 401; for trading and manufacturing purposes, 95; hackney and other coach and conveyance companies, 98; mines and ironworks, 60; internal and external navigation, 52; banks and discounts, 40; assurances, 27; draining and cultivation, 25; theatres, 24; miscellaneous enterprises, 280. One of the causes which has chiefly contributed to the spread and rage of these speculations has been the low value of the shares. In many of these companies the shares represent a capital of no more than 4*l.*, 2*l.*, 1*l.* 8s. 4d., and 4s. 2d. each, which places them within reach of every body, and is calculated to tempt the cupidity whilst it imposes on the ignorance of the poorest. To such an extravagance has this frittering of shares been carried, that the shares of a wine company established with a capital stock of 1,000,000f., or 40,000*l.*, were divided and subdivided, so as to catch all tastes and suit all pockets, into coupons of 10*l.*, 4*l.*, 2*l.*, and 1*l.* each.—*Times.*

The French Expedition to the North Pole, is on the point of sailing. The *Recherche* corvette has left Brest for Havre, where it is to stop but a few days. This expedition, which is under the King's special protection, is provided with everything necessary to ensure success, and nothing that could be useful has been neglected. M. Gaimard, president of the Scientific Commission which is to embark in the *Recherche*, has been presented to the King by the Minister of Marine, to take leave of his Majesty, who received him with great kindness, and again conversed with him about the northern regions, which his Majesty has himself visited. The Kings of Sweden and Denmark have desired that their countries should take part in the labours of the French commission, and have added to it men of learning and officers of acknowledged merit.—*Shipping Gazette*, June 4.

Vienna, May 21.—The works on the Emperor Ferdinand's North Railroad are proceeding with great diligence since the fine weather commenced, and there is reason to expect that it may be completed to Moravia, perhaps too as far as Brunn, in the course of the year. The preliminary operations for the railroad from Vienna to Raab are likewise begun. Between Baden and Wienerneustadt the proper direction of the railroad was through a part of the garden of Dornan, the private property of his Majesty the Emperor. The directors, however, out of respect to his Majesty's property, intended to make the roads divert a little from the direct course; but the Emperor Ferdinand being informed of this intention, immediately declared that the road should pass through his garden, and that if any inconvenience should arise, as may happen from an appropriation of this nature, he would submit to them equally with the meanest of his subjects.

Destruction by Fire of the Steam-Ship Nicolai I.—The St. Petersburgh and Lubeck Steam Navigation Company's vessel Nicolai I., Captain N. W. Stahl, was totally destroyed by fire, between 11 and 12 o'clock, in the night of the 31st of May last, with a crew of 33 persons and 132 passengers on board, while on her voyage from St. Petersburgh to Lubeck. The ship caught fire about a mile from Travemunde road. The captain had the presence of mind to run her ashore within one hundred feet of the land, or they must all have perished; as it was, we are sorry to say, that three passengers and two of the crew were lost, also the St. Petersburgh mail bags, together with three carriages, baggage, and other valuable property, have been totally destroyed.

Navigation of the Indus. - The opening of the Indus appears to have given already an impulse to the native trade, and promises to open new markets for British goods in Candahar, Cabul, and Bokhara, as well as Sinde. Some Parsee merchants have succeeded in navigating the Indus up to Loodenah; and this experiment was followed by another, a boat having reached that place from Bombay, freighted with English manufactures, intended for the Punjaub market. A considerable return trade from the Punjaub to Bombay, in sugar, raw and refined, has also recently sprung up. —*Asiatic Journal.*

Enlargement of the Erie Canal.—The bill for the enlargement of the Erie Canal passed the Assembly on Saturday, April 7th. It appropriates four millions of dollars, and contemplates the completion of the work in five years.—*Quebec Gazette.*

The Welland Canal, we learn, is in excellent order and full operation. Numerous schooners and vessels have passed and repassed since the opening of the navigation. —*Quebec Gazette.*

MISCELLANEA.

March of Invention.—Steam Music.—Amongst the numerous inventions which almost daily claim a share of public attention, we have to notice that of a steam organ, invented and adapted to the "Tyne" locomotive engine, the property of the Newcastle and Carlisle Railway Company, by the Rev. James Birkett, of Ovingham. As far as we are able to judge, this instrument bears the greatest resemblance to the organ: it consists of eight pipes, tuned to compass what is termed by musicians an octave, but without any intervening tones or semi-tones. This is the first attempt to adapt a musical instrument to the steam-engine, capable of producing a tune; and though not so perfect as to admit of all the pleasing variety and combination of sound, capable of being produced by the instrument to which we have compared it, there is no doubt but very considerable improvements will be made in this steam musical instrument by the inventor, who is a skilful musician, as well as an ingenious mechanic. We understand that some important alterations are at present in progress, and intended to be completed previous to the grand opening of the railway. —*Tyne Mercury.*

Society for promoting Practical Design.—On Thursday the 14th ult., a deputation of this Society, consisting of Messrs. Wyse, M.P., Hutt, M.P., Ashton Yates, M.P., Hyde Clarke, and George Foggo, had a gratifying interview with Lord John Russell yesterday, to present two addresses to the Queen from the artists of the metropolis and from the society, praying the removal of the Cartoons of Raphael from Hampton Court Palace to the metropolis.

Aberdeen.—Mr. Elsmie, one of the firm of John Duffer and Co., is building a large vessel, one half of the keel of which is iron. It is intended to obviate the want of a flat floor to keep the vessel stiff. She is one of the sharpest ships ever built here; and if always kept afloat, will most likely prove a good sea boat: but should she happen to get logged, there would be perhaps a difficulty in bringing her to the proper steer again.

Coaches leaving London Daily.—From the list of licensed coaches, published by authority of the Commissioners, it appears that 1,476 coaches leave London daily, exclusive of "short stages."

Santorini.—Some tombs discovered in the island of Santorini by M. Bory St. Vincent, give an importance to this island beyond that of its volcanic celebrity. We pass over ruins of temples, cities, cyclopean walls, cisterns, &c., to the account of vases found in some of the ancient tombs, which have been laid bare by the torrents of rain, and so deprived of the mass of tufa, pumice, &c., under which they have for ages lain hidden. One was about sixteen inches high, and nine in diameter, with a narrow neck, the orifice of which was formed of the head of an eagle or griffin; a graceful and light handle was beautifully adapted to the body of the vase; the colour was like that of blood-stone, and apparently, a lynx devouring a stag with branching horns, was designed upon it in black. This was discovered in the least ancient of the tombs (for there are some of much greater antiquity than others, apparently formed by an unknown race), and contrasted in richness of ornament and shape, with the older pottery. This latter is of a hard, sonorous material, full of grains, perhaps sandstone. The largest vase is two feet five inches high, and one foot nine inches in diameter in the middle, and it had four handles; a second had only two handles, and probably contained a provision of grain for the deceased. The stone has not been artificially coloured except with bands of a chocolate brown, and on one side only have been sketched an imperfect meander, circles, zigzags, cranes, &c. &c.; the other side has no ornament, as it was intended to stand close to the wall.—*Athenæum.*

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH MAY AND THE 22ND JUNE 1838.

THOMAS RIDGWAY BRIDSON, of Great Bolton, in the County of Lancaster, Bleacher; and WILLIAM LATHAM, of Little Bolton, in the same County, Machine Maker, for "Improvements in Machinery, and Apparatus for Stretching, Drying, and Finishing Woven Fabrics."—26th May; 6 months.

STEPHEN GEARY, of Hamilton Place, New Road, in the County of Middlesex, Architect, for "Improvements in the Preparation of Fuel."—28th May; 6 months.

THOMAS RIDGWAY BRIDSON, of Great Bolton, in the County of Lancaster, Bleacher, for "Certain Improvements in the Construction and Arrangement of Machinery or Apparatus for Stretching, Mangling, Drying, and Finishing Woven Goods or Fabrics, and part or parts of which Improvements are applicable to other useful purposes"—29th May; 6 months.

MILLS BERRY, of 66, Chancery Lane, Agent and Mechanical Draftsman, for "Certain Improvements in the means of economizing Heat and Fuel in Furnaces, or closed fire places. Communicated by a foreigner residing abroad."—31st May; 6 months.

JOSHUA WORDSWORTH, of Leeds, in the County of York, Machine Maker, for "Certain Improvements in Machinery for heckling and dressing Flax, Hemp, and other fibrous Materials."—31st May; 6 months.

PETER WALKER, of Liverpool, in the County of Lancaster, Brewer for "An Improved Apparatus to be used in cleansing Beer, and other fermented Liquors."—May 31; 6 months.

LUKE HEBERT, of Camden Town, in the county of Middlesex, Civil Engineer, for "A New and Improved Method or Methods of uniting or soldering Metallic Substances."—31st May; 6 months.

GEORGE NUSSEY, of Leeds, in the county of York, Dyer, for "A new Vegetable Preparation applicable to Dyeing Blues and other Colours."—31st May; 6 months.

WILLIAM RATTRAY, of Aberdeen, North Britain, Manufacturing Chemist, for "Certain Improvements in the Manufacture of the Preparations called Gelatine, Size, and Glue."—31st May; 6 months.

EDOUARD FRANCOIS JOSEPH DUCLOS, late of Samson, in the Kingdom of Belgium, but now of Church, in the county of Lancaster, Gent., for "Improvements in the Manufacture of Zinc, Copper, Tin, and Antimony."—31st May; 6 months.

WILLIAM NEEDHAM, of Manchester, in the County of Lancaster, Gentleman, for, "An Improved Machine called the Silkworm, for the purpose of Spinning, Twisting, and Doubling Silk."—31st May; 6 months.

NICHOLAS RAPER, of Greek street, Soho, in the County of Middlesex, Gentleman, for "Improvements in rendering Fabrics and Leather Waterproof."—31st May; 6 months.

THOMAS WALKER, of Birmingham, in the County of Warwick, Clockmaker, for "Improvements in Steam Engines."—31st May; 6 months.

JAMES HARDY, of Wednesbury, in the County of Stafford, Ironmaster, for "Certain Improvements in Rolling, Making, or Manufacturing Shafts, Rails, Fire-iron, and various other heavy Articles of Metal, and the Machinery or Apparatus used in the same."—2nd June; 6 months.

JOSEPH GREEN, of Ranelagh Grove, Chelsea, in the County of Middlesex, Gentleman, for "An Improvement on Ovens."—2nd June; 6 months.

FRANCIS SLEDDON, of Preston, in the County of Lancaster, Machine Maker, for "Certain Improvements in the Machinery or Apparatus for Spinning and Doubling Cotton, Silk, Flax, Wool, and other Fibrous Substances."—2nd June; 6 months.

DAVID CHEETHAM, Jun., of Hollin's Mill, Staley Bridge, in the County of Chester, Cotton Spinner, for "Certain Improvements in the Machinery applicable to the Preparation of Cotton and other Fibrous Substances for the purpose of Spinning."—5th June; 6 months.

THOMAS BECK, of the Parish of Little Stonham, in the County of Suffolk, Gentleman, for "New or Improved Apparatus or Mechanism for obtaining Power and Motion to be used as a Mechanical Agent generally, which he intends to denominate Rotas Vivae."—5th June; 6 months.

SAMUEL BARLOW, of Croydon, in the County of Surrey, Gentleman, for "Improvements in Paddle Wheels, and in commanding Rotary Motion from Steam or other Power, where Change of Speed and Power are required."—5th June; 6 months.

THOMAS HAMMOND FISKE, of Portsmouth, in the County of Hants, Watch and Clock Maker, for "Improvements in Apparatus for Measuring and Indicating the Depth of Water in a Ship's Hold."—5th June; 6 months.

CHARLES KNIGHT, of Ludgate Street, in the City of London, Bookseller and Publisher, for "Improvements in the Process and in the Apparatus used in the Production of coloured Impressions on Paper, Vellum, Parchment, and Pasteboard, by Surface Printing."—7th June; 6 months.

SAMUEL CLEGG, of Sidmouth Street, Gray's Inn Road, in the County of Middlesex, Engineer, for "Improvements in Gas Metres."—7th June; 6 months.

JOHN COOPE HADDAN, of Duke Street, Westminster, in the County of Middlesex, Gentleman; and JOHN JOHNSTON, of Cursitor Street, Chancery Lane, in the City of London, Brass Founder, for "Certain Improvements in Warming, in Lighting, and in Ventilating."—7th June; 6 months.

HERMAN KESSELS, Major in the Belgian Artillery, and Knight of several Military Orders, but now residing in St. Mary Axe, in the City of London, for "Certain new and improved Means or Apparatus for Saving of Lives and Property from Fire, which he denominates 'The Salvator.'"—7th June; 6 months.

ROBERT THOMAS, of No. 86, St. James's Street, in the City of Westminster and County of Middlesex, Boot Maker, for "Certain Improvements in Apparatus to be attached to Carriages, for the purpose of preventing Horses from starting, and for stopping or restraining them when running away or descending Hills."—7th June; 6 months.

EDWARD JOHN MASSEY, of Liverpool, in the County of Lancaster, Watch Maker, for "Certain Improvements in Chronometers and other Time Keepers."—9th June; 6 months.

ARCHIBALD RICHARDSON, of Hackney, in the County of Middlesex, Distiller and Wine Merchant, for "A new and improved Mode of producing a pure Spirit from Malt, and all kinds of Grain, and from Vegetable Substances of every Description containing Saccharine Matter."—12th June; 6 months.

JAMES REED, of Bishops Stortford, in the County of Hertford, Stone Mason, for "Improvements in joining Slate, Stone, and Marble, for Cisterns and other Purposes." 12th June; 6 months.

BENJAMIN LEDGER SHAW, of Henley, near Huddersfield, in the County of York, Clothier, for "Improvements in preparing Wool for, and in the Manufacture and Finishing of Woollen Cloths, parts of which Improvements are applicable to the receiving and stretching of other Fabrics."—12th June; 6 months.

SAMUEL PARKER, of Argyle Place, in the County of Middlesex, Lamp Manufacturer, for "Improvements in Lamps and Apparatus connected therewith."—12th June; 6 months.

RICHARD MARCH HOE, late of New York, in the United States of America, but now residing at No. 66, Chancery Lane, in the County of Middlesex, Civil Engineer, for "Certain Improvements in Machinery or Apparatus for Grinding and Polishing Metal Surfaces."—12th June; 6 months.

RICHARD MARCH HOE, late of New York, in the United States of America, but now residing at No. 66, Chancery Lane, in the County of Middlesex, Civil Engineer, for "Certain Improvements in Machinery or Tools, and Apparatus for chipping, levelling, smoothing, and polishing the Surface of Stone, Slate, or such other Materials."—12th June; 6 months.

HENRY ROBERT ABRAHAM, of Keppel Street, in the Parish of St. George, Bloomsbury, and County of Middlesex, Civil Engineer and Architect, for "New or improved Apparatus for regulating the Supply of Water or other Liquids, and the Quantity delivered into Receivers."—14th June; 6 months.

JOSEPH WINTER, of Fountain Court, Cheapside, in the City of London, Glover, for "Improvements in Painting, Printing, or otherwise Ornamenting the Surfaces of Leather, Silk, Cotton, or Linen, which Improvements are particularly applicable to the Manufacture of Gloves, Stockings, and such like Articles."—14th June; 6 months.

JOSEPH BOLTON DOE, of Hope Street, Whitechapel, in the County of Middlesex, Iron Founder, for "Certain Improvements in Apparatus used in the Manufacture of Soap."—14th June; 6 months.

HENRY DAVIS, of Wednesbury, in the County of Stafford, Engineer, for "Certain Improvements in Engines or Machines to be used for obtaining Mechanical Power, also for raising or impelling Fluids."—14th June; 6 months.

JOSEPH BUNNETT, of Deptford, in the County of Kent, Engineer, for "Improvements in Steam Engines."—14th June; 6 months.

GEORGE PRICE, of Cornhill, in the City of London, Esq., for "Improvements in clarifying Water and other Liquids; communicated by a Foreigner residing abroad." —14th June; 6 months.

RICHARD GOODRIDGE, of No. 7, Bell's Buildings, Salisbury Square, in the City of London, Purser in her Majesty's Navy, for "A new or improved Apparatus for lifting or raising Fluids on Water or on Land, and for Marine or propelling Purposes without Steam."—14th June; 6 months.

JOHN WHITE, of the New Road, in the Parish of St. Marylebone, and County of Middlesex, Architect, for "Certain Improvements in the Construction of Railroad Bridges and Viaducts."—18th June; 6 months.

WILLIAM GOSSAGE, of Stoke Prior, in the County of Worcester, Manufacturing Chemist for "Certain Improvements in Manufacturing Iron."—18th June; 6 months.

WILLIAM GARNETT, of Haslingden, in the County of Lancaster, Dyer, for "Improvements in Machinery, for spinning and doubling Wool, Flax, Cotton, Silk, and other fibrous Materials; communicated by a Foreigner residing abroad."—19th June; 6 months.

WILLIAM EDWARD NEWTON, of Chancery Lane, in the County of Middlesex, Mechanical Draftsman, for "Improvements in Diving Apparatus; communicated by a Foreigner residing abroad."—19th June; 6 months.

JOHN WILLIAM FRASER, of Arundel Street, Strand, in the County of Middlesex, for "Improvements in raising or floating sunken and stranded Vessels, and other Bodies."—22nd June; 6 months.

ELIZA CHATER WILSON, of Skinner Street, Snowhill, in the City of London, Printer, for "Improvements in Evaporation; communicated by a Foreigner residing abroad." —22nd June; 6 months.

NOTICES TO CORRESPONDENTS.

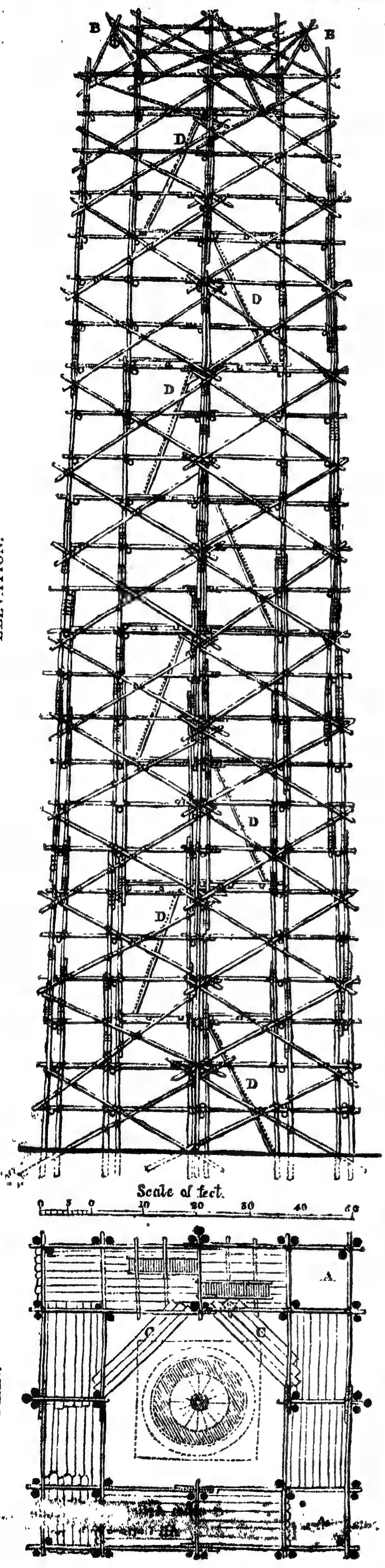
The further notice of Mr Bruff's treatise on Surveying, is unavoidably postponed; as are also several other articles, in consequence of the necessity of publishing the present number several days before the usual time.

The first number of the Journal having been reprinted, complete sets of the work may now be obtained.

ERRATA IN LAST NUMBER.

Page 220, col. 1, line 21, for *Wilkes's*, read *Wilkins's*.
„ 222, „ 2, for *myself to*, read *myself in*.

In advertisement "To Engineers engaged upon Railroads, Architects," &c. for 3s. read 30s., the price of the new machine for taking angles.



SCAFFOLDING USED IN THE ERECTION OF THE MONUMENT.

ELEVATION.

PLAN.

SCAFFOLDING USED IN THE ERECTION OF THE MONUMENT.

The fame of the Monument has spread far and wide; the reader of history is acquainted with it as raised in commemoration of the terrific fire of London; and still as generations pass away, it rears its head conspicuously and attracts the attention of passers by; except indeed of those,—and multitudes they are,—to whom use has familiarized its sight, and who therefore disregard it. Of late years indeed it has missed the shoals of people that used to pour along close by its base, to old London Bridge; and looking down from its balcony at top, it has watched the building of the new and the destruction of the old bridge. Yet the change has by no means tended to throw the Monument into the back-ground;—we beg pardon, the Monument has been thrown into the back-ground, but it has gained greatly by the alteration;—for whereas before it was difficult to find a good view of it in its whole height, since the human neck cannot conveniently turn backwards indefinitely, the new approaches to London Bridge, and the improvements in that neighbourhood, have opened various vistas to it by which it is seen to great advantage.

Yet of the millions that are constantly passing by the Monument,—of the thousands that give themselves the trouble to look at it,—of the hundreds that further take the pains to consider it as an imposing piece of architecture,—and of the tens (principally perhaps professional men) that sometimes picture to their imaginations the times of its construction,—we dare venture to say, units would number those that have ever thought of the *Scaffolding* used in its erection. Indeed we are obliged to our correspondent whose communication is given below, and whose drawing illustrates his observations, for turning our attention to a subject so important, and so little noticed. We do with scaffolding, as with packing cases,—throw it aside when its immediate use is over.

Since Wren's time, the building of obelisks and columns has of course received attention, and consequently important modifications. And,—let us not be thought to descend too abruptly from the grand to the useful,—one totally new branch of building, somewhat similar, has been introduced since those days; the erection of steam-engine chimneys, which in height frequently rival the ordinary run of columns and pillars. In the manufacturing districts too, these are frequently built in a very ornamental style, and are really striking and imposing objects; but for the modern style of chimney, we may refer to a much nearer spot, the Camden Town depot of the London and Birmingham Railway. Chimneys of this kind are now generally erected by means of platforms arranged in the interior.

In our last number, p. 241, we alluded to an ingenious contrivance for building an obelisk without scaffolding, described in the recently published Transactions of the Society of Arts. It was designed by Mr. T. Slacks, Mason, of Langholm in Eskdale, Dumfriesshire, and employed by him in the erection of a monument in that neighbourhood, in memory of Major-General Sir John Malcolm, G.C.B., K.L.S., &c. The obelisk is hollow, with thorough bond stones inserted occasionally for strength. These bond stones were perforated in the centre, to allow free passage for a pole, 40 feet long, passing through three of them and working with a collar of hard wood on the topmost of them, turning freely on friction balls. This pole was furnished with a cross beam at top, having pulleys at the ends, and various ingenious contrivances for raising the materials by means of a windlass below. The pole was raised successively from one station to another as the work progressed; an operation so easily performed as to occupy no more than two hours. The pyramidal apex of the obelisk was finished by means of a hanging scaffold; the pole having been sawn off at the last course before the beginning of the apex, and buried in the work.

The column lately erected at Plymouth to the memory of Nelson, by Mr. Foulston, was likewise constructed without scaffolding. Of this work we hope to be able to learn some particulars; for the present we conclude by subjoining the description of Sir Christopher Wren's scaffolding, furnished by our correspondent.

There is perhaps at the present day no subject on which the attention of the scientific world has been less employed, than the art of constructing scaffolding. Yet in building, there is perhaps no portion which requires more skill and merits more attention to its construction, in order to its effectually answering the purposes required during the progress of the works; especially where they are of so stupendous a nature as that with which we have at present to do.

The accompanying drawings are an exact representation of the scaffolding used by Sir Christopher Wren in the erection of the Monument, [illegible] considered a fine specimen of the art whose claim to [illegible] we have put forward in our previous observations. They consist of a geometrical elevation of one side, and

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a plan. They are accurately taken from a most ingenious model on the scale of an eighth of an inch to a foot; which although bearing evident marks of its antiquity, remains perfect in almost every respect. It formerly belonged to Sir William Chambers, and was afterwards presented by Heathcote Russel C.E. to Mr. Brunel, Engineer-in-Chief of the Thames Tunnel, in whose possession it still remains: and to his courtesy we are indebted for the accompanying drawings.

At A, A, on the plan, the angles were left free from scaffold boards, for the purpose of hoisting the stone to the shear dericks at the top, shown on the elevation at B, B. Scaffold boards were laid as the work proceeded, across the angles as shown at C, C, on the plan. The whole of the scaffolding was constructed with the ordinary sized poles, reserving the largest for the base. The ladders D, D &c. were of the rude construction of the times of Sir Christopher Wren, formed of two uprights with nailed treads or rounds on the face; and in all cases reaching three stories of the scaffolding.

REVIEWS.

A Treatise on Engineering Field-work: containing practical Land-surveying for Railways, &c., with the theory, principles, and practice of Levelling, and their application to the purposes of Civil Engineering. By PETER BRUFF, Surveyor, &c. London: Simpkin and Marshall, 1838.

(Second Notice.)

In a former number of our Journal, we noticed this work, and promised to complete our review of it by recurring to the latter portion of the treatise, which relates to Levelling. In compliance with this promise, we shall now enter rather fully on the examination of what remains.

Mr. Bruff first explains *The Theory and Principles of Levelling.* Here we must repeat the observation which we made on two of the divisions of the earlier part of the work;—it is far too brief. The work, we apprehend, is not intended for the experienced practitioner, as it exhibits but little that ought not to be already known by every man who pretends to be an engineer. We conclude then, that it has been written for the student; and if so, the author should have entered more fully and minutely into the explanation of the theory and principles of the science. For without these minute points being very fully and clearly explained, we defy any inexperienced pupil to understand the subject thoroughly. Mr. Bruff has given the groundwork for forming an excellent treatise; and we would advise him, if he should be fortunate enough to publish a second edition, to extend the work to at least double the size. As we proceed with our review, we shall very freely point out the deficiencies of the work in its present form, and where by additions it may be materially improved.

Mr. Bruff commences this part of his work by explaining the theory of levelling, and the allowance that must be made for the difference between the true and apparent level, and for the atmospheric refraction. In practical levelling when back and fore sights are taken at nearly equal distances from the instrument, no allowance need be made for either.

But before we proceed further, we must point out the great inconvenience caused by the manner of pointing the decimals which is adopted in this work, and which we have also noticed in others. It cannot be too strongly condemned, as likely to lead to very serious errors in reading and properly understanding the calculations. The inconvenience of which we complain, is the using of the comma (,) for pointing the decimals, instead of the full point (.). We cannot better illustrate the inconvenience than by copying the following sentence from p. 85.

The mean diameter of the earth being nearly 7,916 miles, if we first take B C = 1 mile, then the excess $\frac{BC}{2AC}$ becomes $\frac{1}{7916}$ of a mile, which is 8,004 inches, or 6,670 decimals of a foot, for the distance of the apparent above the true level at the distance of one mile.

It will be observed here, that the thousands of the whole number 7,916 are pointed off with the comma, which, as noticed above, is also used for pointing off the decimals. So that if it were not well known to the contrary, the mean diameter of the earth would appear to be 7 miles and 916 decimals of a mile, instead of seven thousand nine hundred and sixteen miles. Or the excess of a mile might be read in the above sentence, by an unthinking reader, as eight thousand and four inches, instead of eight inches and four thousandths of an inch. It would have been far better to have pointed the numbers thus;—7,916 miles, as in the sentence quoted—and the excess of a mile, 8.004 inches or .6670 decimals of a foot. There could not possibly, with this pointing, be any error committed by a person acquainted with decimals. Again in p. 157, where the author is treating of the method of calculating earth-work, another serious difficulty occurs from a similar cause; 128.795,6180 is given as the number of cubic yards in an embankment. Here the full point and the comma appear to have changed places; we suppose it to mean 128,795 cubic yards and 6180 decimals of a yard. But by the method of pointing generally adopted, it would be 128 cubic yards, and the remaining figures would denote decimal parts of a yard.

The next portion of the work is *The Practice of Levelling.* The author first describes the nature of the *datum* line; he next explains the method of obtaining the difference of level between two or more points by fore and back sights; and afterwards gives an example, being part of a contract section taken for a railway. Extracts are subjoined from Mr. Bruff's field-book, of which we give a short example.

Elevation.	Back Set.	Fore Set.	Depression.	Total Rise.	Distance.	REMARKS
				80,96	B.M.	Height above Trinity Datum. Level of ground at B.M.
1,11	6,84	5,73		82,07	0,00	
	5,73	8,10	2,37	79,70	,15	
	8,10	8,15	,05	79,65	,45	
2,35	8,15	5,80		82,00	,50	
,80	5,80	5,00		82,80	1,10	
,45	5,00	4,55		83,25	2,17	
,96	5,01	4,05		84,21	2,60	
	4,05	4,98	,93	83,28	4,00	
	4,98	6,12	1,14	82,14	5,00	
	6,12	6,67	,55	81,59	6,00	
	2,25	7,77	5,52	76,07	8,00	
	7,77	13,52	5,75	70,32	10,00	

The method of procedure in setting down, casting out, and reducing the levels in the above form of field book, will be easily understood on reference thereto. In the second and third columns are entered the back and fore sights, opposite to each other: the first contains the difference of the two, if a rise; if a fall, it is entered in the fourth,* the differences in this form being set down in the order they are cast out. The fifth contains the reduced levels, obtained by adding or subtracting the differences to the previous reduced level; the sixth the distance (which will be perceived is continued from the commencement to the end of the section); and the last, which is the largest, for remarks, to note the crossings of roads, rivers, brooks, &c., and, if necessary, to enter the bearing of your line of levels; but in the above case no bearings were taken, as the ground had been surveyed, and the line definitely marked out. * *

The sketches of the crossings of roads, rivers, &c. in the fifth column need no explanation; they are plotted to a large scale on the section, and will be found of infinite service to the engineer in guiding him as to the dimensions of his bridges, so as to maintain a proper width of roadway, &c.

The above example of a field-book comprises all the data requisite or necessary for drawing a contract section, for which purpose it was taken. The levels are based on Trinity datum, which was previously ascertained, and bench marks left at each end. * *

The plotted section from the above field-book is given at the end of this treatise, by referring to which, and carefully looking over the field-book, the student will become perfectly acquainted with every particular necessary for the purpose.

In the above field-book it will be observed that Mr. Bruff does not number his stations; this we think ought to be done in all cases, and we find it particularly serviceable for referring to the bench marks and fences, and also for reference when a cross section is taken. Neither is there a column for *total depression,* which we consider indispensable; for in levelling a long line of country it is frequently necessary to employ several surveyors, each with different datum lines, which must afterwards be re-adjusted to one general datum line. We have found in practice that the surface line of the country sometimes comes below as well as above the datum line. We also prefer taking the distances from station to station, and afterwards adding them together as shown below in the subjoined copy of a portion of one of our own level-books. This we consider decidedly a better plan than Mr. Bruff's, and it is adopted by many others besides ourselves.

* When the difference of columns 2 and 3 have been cast out, the four columns should always be added up at each page, previous to reducing or carrying the difference to column 5; the total rise or fall will correspond, if correct; the reduced level must also correspond by deducting the quantity brought forward at the commencement of each page.

Number of Station.	Distance.	Total Distance.	Back Station.	Fore Station.	Rise.	Depression.	Total Rise.	Total Depression.	Observations.
1							4·00		No. 1, top of step at the junction of Roads above Trinity Datum.
1—2	440		6·80	6·67	0·13		4·13		No. 2, corner of Bond-street.
2—3	1200	1640	5·75	5·45	0·30		4·43		No. 3, opposite No. 10.
3—4	366	2006	4·70	4·72		0·02	4·41		No. 4, centre of Bond-st. & Miles-st.
4—5	570	2576	3·50	8·54		5·04		0·63	No. 5, centre of T. rd., Cross Station A.
5—6	160	2736	5·26	4·60	0·66		0·03		No. 6, op. Road leading to Windmill.
6—7	600	3336	6·46	8·35		1·89		1·86	No. 7, opposite Wharf.
7—8	300	3636	4·81	3·65	1·16			0·70	No. 8, opposite Factory.
8—9	510	4146	4·36	3·25	1·11		0.41		No. 9, opposite Brewery Gate.

It will thus be seen that our level-book has three additional columns when compared with that of Mr. Bruff; and all these we consider indispensable.

Mr. Bruff next proceeds to give some brief directions for proceeding with the levels, and remarks :—

——that it is always preferable to use one staff only, on account of the difference of the graduations, although made by the same person with ever so much care. We have frequently, when adjusting our instrument, found a difference of $\frac{1}{100}$ of a foot in the readings of two staves, although made by the same person, and no doubt the errors are often much greater. To avoid this source of error, we would always advise the use of one staff in preference to two; as in the latter case there is very little, if any, time saved, an additional expense incurred, and the chances of error greatly multiplied.

Here we must differ from Mr. Bruff; as we think that his remedy is far worse than the evil. Suppose there be a difference of $\frac{1}{100}$ of a foot in the reading of the two staves;—it will be rendered nugatory in a continuous line of observations, as the *two* staves become alternately the back and fore stations, and consequently compensate each other. We consider two staves so very requisite, that we would never recommend a line of levels to be taken without them. Nor would we on any account allow the back staff to be removed, until the sight of the fore staff is taken and entered, and the instrument re-examined to see if it remain in proper adjustment.

In the next section, the utility of *Bench marks* is explained; and in several following ones it is shown in what manner *Trial levels, Check levels*, and *Cross sections* are made, and for what reasons recourse is had to each.

The next chapter is *On Chaining*, explaining "the methods of passing woods and rivers, and overcoming difficulties that occur in levelling;" which contains some useful hints relating to these operations. In a section on *Levelling with the Theodolite*, after having given some explanations and examples, the author observes :—

The above method of levelling with the theodolite, may be advantageously adopted in taking trial sections for crossing summits—one section should be carefully taken with the spirit-level, the remainder may be taken with the theodolite—vertical angles being measured to the bench-marks at the extremeties; any errors that may have crept into the calculations will then be detected.

If this plan was adopted, how much expense would be saved; comparative sections may then be taken in every direction without the enormous expenses incurred by the present method. Such correct results may not be arrived at certainly as with the spirit-level, but in these preliminary sections, of what consequence is the differing a few feet, when perhaps the *crossing of a summit may be effected thereby at a less elevation by ten times the amount of error.* The theodolite is not put in comparison with the spirit-level for accuracy, but for the above purposes, where a near approximation is all that is necessary, it is presumed it will be found a far more advantageous instrument, as, in some districts, the surveyor might do ten times the quantity of work as with the spirit level.

In his observations *On the choosing of a Datum Line*, Mr. Bruff appears to prefer taking the level of low water spring tides as a datum; and he states that it is considered more equable, and is now generally taken by engineers as their datum line. We feel disposed to differ from the author on this point; and we consider high water spring tides preferable for a datum line, as giving at a glance a good idea of the possibility of obtaining a good drainage for the country when intersected by embankments or excavations. For if at any point on a railway line, you find an elevation of from three to four feet per mile above high water mark of the river or sea from which you have set out, you may generally calculate on being able to obtain a good drainage; but this will not be so readily seen if the low water datum be adopted. For extensive operations, Mr. Bruff advises

—— the mean level of the sea to be taken; which (according to M. De la Lande's method, and adopted in the Trigonometrical Survey of England) may be obtained by taking the level of low water, and deducting therefrom one-third of the height to which the tide rises.

The work proceeds to treat of the different *Instruments used in Levelling*, with their various adjustments. Under the head of *Levelling Staves*, the author explains an improvement contrived by himself, which appears to us worthy of notice.

A staff has been contrived by the author, which will be found more convenient than any that has appeared before the public; one great fault with the improved staff is, that in reading off with an inverting telescope (which nearly all levels have now, for reasons before explained) you are very liable to error from the figures appearing upside down, you are consequently apt to mistake one figure or division for another, often leading to serious errors. To remedy this inconvenience *the figures on this staff are inverted*, whereby, when viewed through an inverting telescope, they appear in their natural order, doing away with the confusion and uncertainty hitherto existing, and enabling the observer instantly to note the reading with expedition and accuracy, altogether making a considerable difference both as to the quantity and accuracy of the work.

There follow sections *On the setting out of Railways*, on the *Manner of putting in the Widths*, and *On Gradients*, &c. &c., containing some useful remarks and directions.

Appended to the work are several drawings of Plans and Sections illustrating it, and rendering the whole more readily understood.

What Style? The Royal or Baronial? The Priestly or Monastic? Or the Squirely? For the New Houses of Parliament. By ARCHILOCHUS. London: T. and W. Boone. 1837.

Having never heard of this pamphlet, nor seen it advertised till very lately, we imagined it to be but just published, whereas it bears the date of 1887. If this be an error of the press, it is a very strange one, —yet not at all more strange than the pamphlet itself, for though we have patiently read it through, we must confess that we do not comprehend it. It looks as if it were intended to be particularly witty, yet whether it really be so must be decided by those who can make anything at all out of it. We very much question, however, whether it be in the power of any one to do so, except Archilochus himself.

Whether or for what purpose this unintelligibleness is assumed, we know not; but after the two or three first pages, which are written intelligibly enough,—so much so that we hoped to be able to gather something from the writer's remarks; he plunges into such downright extravagance that we cannot even guess what he would be at—what it is that he would recommend, or what he actually objects to. To such extent is mystification carried, that in the pretended account of the discussion between the Commissioners, the initials of their names are said to be R.J., A.T., G.P., T.W., and P.P. Now if in order to avoid the appearance of personality, the writer had chosen to give fictitious or burlesque names, there would have been nothing very unintelligible in that; but that he should give false initials where the names themselves are no secret, is quite inexplicable. He might just as well at once have substituted Pam for G. P. as speak of "G. P., the subtle orator, who went by the name of Pam." Among a great deal of other stuff, this oratorical gentleman is made to say, "The new surtout in which Windsor Castle has been dressed, that happy thought of a warlike front without the means of offence and defence, though it has removed all associations of the sovereigns prior to George IV., and stands by its style a monument of obedience to those two commandments, and of that monarch's peculiar good taste;" to which is added "and there was a kind of catch among the committee, of Great King, Pious Prince, Gusto, Gusto!" There is page after page in the same exceedingly funny strain—for funny, we presume it is—at least meant to be so, though it puzzles us to conceive that there is any meaning at all. For aught we can tell Archilochus may be a very clear-headed fellow, and has only put himself into disguise: but it is rather too bad in him to make his readers feel quite bewildered and muddy-headed over his pages. Why any one should take so much pains as Archilochus does, to act the Sphynx, is to us a perfect mystery.

Project for a National Gallery on the Site of Trafalgar Square, Charing Cross, Proposed and Designed by Joseph and John Sebastian Gwilt, Architects. [Not published.]

We have not been favoured with a copy of this unpublished "Project," and therefore know no more of it than what we are told by the "Literary Gazette," which has been so distinguished. Our only reason for regretting that we must speak after the report there given, is that we are at the same time deprived of a sight of the design, which judging from the title, we presume accompanies the No-Publication. To be sure the words within brackets generally operate as a strong provocative to curiosity; but the Gazette has quite satisfied our curiosity as to the main point, namely that Mr. Gwilt's

—we beg John Sebastian's (qr. *del piombo*) pardon—Messrs. Gwilt's design is likely never to appear before the public at all;—that is, if it is forthcoming only when called for,—because a more preposterous scheme than their project has hardly ever been seriously brought forward; and that is saying a great deal considering what heaps of *moon*-shine have been brought to market by projectors and speculators.

Messrs. Gwilt, with the most graceful modesty imaginable recommend their new Design to be carried into execution, and a building erected from it—where?—why, on no other spot of ground within the Bills of Mortality than Trafalgar Square itself, they having discovered that it is "an enormous vacant area of no utility." It is a monstrous pity Mr. Joseph Gwilt was not enlightened with this idea some years ago when there was so much bickering in the papers relative to the site chosen for the National Gallery; and in which he himself took so very active a part. Had he stepped forward with such advice then, he might perhaps have had the credit of being actuated by professional zeal and public spirit; whereas to make the suggestion now, looks very much like malice and officiousness.

What has become of Mr. Joseph Gwilt's anxiety for St. Martin's Church, which he was then of opinion ought to be as much exposed to view as possible?—whereas he would now quite screen it again, by clapping an extinguisher upon the Square itself. It must be admitted that the case would be somewhat altered; because although had Mr. Wilkins brought his building as far forward as he originally contemplated, the portico of the Church would have been partially hidden from Pall Mall East; there ought to be no objection to allow the Gwilts, Joseph and John Sebastian, to shut it out from view entirely, in regard to Cockspur-street and Charing Cross.

Even such an idea is exceedingly modest; yet perhaps not at all more so than the opinion expressed of the Design itself. "A building," we are told, "three hundred and forty feet in length, rising to a height of eighty-one feet (being three feet higher than the Banqueting House at Whitehall), of extreme simplicity in its general form and detail, will at all events form a feature to which all the objects within the range will be subordinate;"—St. Martin's therefore, of course as well as the rest. This is positively startling, for we here find the Gwilts' proposing to render that church and everything else secondary to their own design, and to overpower it by the height and mass at least of *their* National Gallery; for as to decoration, that they seem to disclaim. The building they contemplate is to be marked by "extreme simplicity," and fully sure are we that the plan is characterised by extreme simpleness.

One of the allegations against Mr. Wilkins' building is, that it is considerably too low; yet we very much question whether Mr. G. would not have inveighed against it quite as furiously as he now does, had it been much higher: for he would then have protested against it—perhaps have likened it to a "tall bully," on the ground of its making his favourite St. Martin's look, if not fowl, at any rate *fish* by comparison,—videlicet quite *dwar-fish*. It appears to us that extent of length not of height best befits the character of a "Gallery," both internally and externally; so that what is censured as a defect, may as justly be applauded as a propriety. Were the rooms much loftier, either the upper part of the walls must be left blank, or else a great number of pictures put out of sight,—hung up so as to be ornamental furnishings, but not so as to be properly viewed and studied. It must be admitted that the Sebastian del Piombo would be seen to greater advantage in a room a few feet higher; but taking the collection generally, the rooms are quite lofty enough for the paintings. But it is urged that although it may answer its purpose just for the present, the building is utterly inadequate to receive such a collection as ought to be formed. We do not dispute this; yet we consider it neither an imputation on the architect (who was limited to a narrow slip of ground); nor irremediable in itself. On the contrary without adopting the suggestion of the Literary Gazette, either to pull down the Gallery or convert it into Barracks, all difficulty might be got over at once by the site of the adjoining barracks being given up for the extension of the Gallery. It is so spacious that by covering it with buildings around a court, the present size might be nearly quadrupled; besides which another quadrangle surrounded with galleries might be added at the West end of the edifice, behind the houses in Pall Mall East; as shown in the plan given in the Report of the Select Committee on Arts &c. Such additions may at any time be made with equal facility and economy; because as the buildings so situated would be completely shut out from view, the external walls would require to be only plain brick, without any ornament or finish whatever.

The idea of taking the National Gallery down is so extravagantly preposterous that we can hardly imagine it to be seriously entertained for a moment even by those who have not scrupled to propose it. If deficient in spaciousness within, what has been erected is at least a façade, the building behind which may be extended as circumstances shall require, and certainly much more economically than by beginning entirely *de novo*. If too the façade itself be not exactly what could be desired, it is capable of being finished up, and otherwise improved without greatly disturbing the design as it now is. After all, whatever we may think of the Gwilts' modest scheme, we do admire the prudence or forbearance which withheld them from exhibiting their own design at the Royal Academy. Such modesty however is neither valorous nor virtuous; least of all public-spirited; inasmuch as, we venture to say, it has robbed the public of—a hearty laugh.

Proposed plan for improving Dover Harbour, by an extension of the South Pier Head &c.: also, copious extracts from various Authors in support of the Plan, and showing the importance of Dover Harbour from the time of its first construction. By Lieut. B. Worthington, R.N. Dover: 1838.

The importance of Dover Harbour in a national point of view, will be disputed by none; its proximity to one of the most powerful empires of Europe has rendered it famous from the earliest periods of our history, whether in times of peace or war; and the closer become our relations with our continental neighbours, the more completely will the Straits of Dover serve as the highroad of our intercourse, especially when those great lines of railway shall be completed, which are designed to connect London with Dover, and Paris with Boulogne or Calais. As an engineering work too, the improvement of the harbour is intimately connected with the objects of our Journal; and the two considerations combined, appear to demand from us more than ordinary attention to the subject. We shall therefore enter minutely and critically into an examination of Lieut. Worthington's suggestions; acting in the spirit of his chosen motto, we shall

——— "nothing extenuate,
"Nor set down aught in malice,"

and in doing so, we are sure he will allow us the liberty of freely commenting on his proposals. For we have both at heart the same object;—to endeavour to awaken public attention to the necessity of keeping this valuable harbour in a state of efficiency, and of extending as far as possible its public utility.

Lieut. Worthington has collected together a great mass of useful information connected with Dover Harbour, for which the public is deeply indebted to him; for this is the only way by which a right understanding can be arrived at, respecting the best mode of improving the harbour. He commences by giving various extracts, showing "the state and importance of Dover Harbour." The first of these, from "a memorial presented to Queen Elizabeth, by Sir Walter Raleigh, Knight," is so much to the purpose, and by its expressive language condenses into so small a compass such weighty considerations showing the importance of the harbour, that we cannot do better than give the whole.

"No promontory, town or haven, in Christendom, is so placed by nature and situation, both to gratify friends, and annoy enemies, as this town of Dover; no place is so settled to receive and deliver intelligence for all matters and actions in Europe, from time to time; no town is by nature so settled, either to allure intercourse by sea, or to train inhabitants by land, to make it great, fair, rich, and populous, nor is there in the whole circuit of this famous island any port, either in respect of security and defence, or of traffic or intercourse, more convenient, needful, or rather of necessity to be regarded, than this of Dover, situated on a promontory next fronting a puissant foreign king, and in the very streight, passage, and intercourse of almost all the shipping in Christendom."

"And if that our renowned King (Henry 8th), your Majesty's father, found how necessary it was to make a haven at Dover (when Sandwich, Rye, Camber, and others, were good havens, and Calais also was then in his possession), and yet spared not to bestow, of his treasure, so great a mass, in building that pier, which then secured a probable means to perform the same; how much more is the same now needful, or rather of necessity (those good havens being extremely decayed), no safe harbour being left in all the coast almost between Portsmouth and Yarmouth. Seeing, then, it hath pleased God to give unto this realm such a situation for a port and town, as all Christendom hath not the like, and endowed the same with all commodities by land and sea, that can be wished, to make the harbour allure intercourse, and maintain inhabitants; and that the same once performed, must be advantageous to the revenue, and augment the welfare and riches of the realm in general; and both needful and necessary, as well for the succouring and protecting friends, as annoying and offending enemies, both in war and peace; methinks, there remaineth no other deliberation in this case, but how most sufficiently, and with greatest perfection possible, most speedily the same may be accomplished."

The following extract from the Archæologia, vol. xi. p. 241, is on of great importance.

STATE OF DOVER HARBOUR BOTH BEFORE AND SINCE THE BUILDING OF THE PIER, WITH THE ALTERATIONS MADE BY THE BEACH, AS IT IS FOUND BY THE EXAMINATION OF THE MOST SENSIBLE, ANCIENT, AND SKILFUL MEN, BY DIRECTION OF THE LORD ADMIRAL OF ENGLAND, BEING AT DOVER, DEC. 21st. 1581.

"Before the pier was built out, there are men alive can remember that there was no banks or shelves of beach to be seen before Dover, but all clean sea, between Archcliff tower and the Castle cliff."

"By experience it hath been always found that as the pier was built out, so the banks of beach also began to grow, and lay farther out as the pier was farther built, and as the pier hath decayed, so these banks of beach also have been either scoured away, or driven farther in, and that those banks of beach never rest farther forth into the sea, then they are defended by the pier."

"Also it is found that the making of groins will ever encrease the quantity of beach, and the decay or pulling down those groins, doth also cause the same bank of beach to wear away so far forth as the groins are built or taken away."

"Also it is found that the abundance of beach is so great as they cannot be stayed by any groins, but that they will fill the groins, and then go about them, holding on their course as the flood carries them."

"Also that there is no other entrance or haven mouth at this present, but such as the ebbing out of the sea water, and course of the river do keep open."

"It is also found by experience that the same mouth or entrance doth always grow nearer and nearer towards the town; and that in times past it hath grown so near, that by the violent rage of the sea, passing through the same, a part of the town itself hath been in danger to be overthrown."

"Also it is found, that the beach hath, and doth increase still more and more, under and beyond the Castle."

"Also that lately where five rods of bavin work have been made up of the broken pier, the beach is also grown out to the end thereof, and so groweth down from thence lower and lower towards the town-ward."

"Also it is found that the great rocks that were sunken by king Henry VIII. do still lie there, and are not removed by any violence of sea, but by the wearing of them, or looseness of the ground under them, have sunk somewhat lower and lower."

"Also it is found that part of the pier standeth on a firm rock of chalk, and part on a soft soil."

"Also it is apparent at this present, that where the beach and ooze are incorporated together in a main shelf, it so retaineth the water inclosed within the same, towards the cliff, that there is ever a long standing pool of water, twelve feet at least higher than the sea without at low water."

It is surprising that with such a document before them, Lieut. Worthington and others should have committed the error, which to us they appear to have done, of recommending the extension of the pier head, or the formation of a breakwater. We consider that the whole of the so-called improvements that have been carried on, consisting of successive extensions of the pier, have been the cause of the formation of the *bar* at the mouth of the harbour. We shall however enter more fully into this part of the case below.

The author gives a great variety of other extracts from official and other documents of various periods from the reign of Henry VIII. down to the present times, showing the various states of the coast, and embodying the recommendations of different engineers who have been employed from time to time to report on the improvement of the harbour. Most of these recommendations consist of the proposal to extend the South pier head. Mr. Ralph Walker in his report of 1812 recommends that,

"———— the *south pier head should be extended out as far as low water mark*, which would be the means of carrying the beach into deep water, and increasing the velocity of the flood stream round it, and would tend much to carry the beach *past the entrance*, and whatever might be deposited there by the flood tides would be more exposed to the currents of the reflux of the tides, as they would not be deflected without it by the north pier-head; and if the culvert or tunnel proposed by Mr. Moon should be adopted, and carried out through the pier from the outer pent, I am of opinion that it would be of great advantage in scouring away the beach, not only at the times of low water, but also to draw the sluices off a little before low water at the times of spring tides when there would be abundance of water. I am aware it may be said, that the beach carried away then would be brought back with floods and westerly winds, but let it be kept in mind that by being carried further out into deep water, *it will be carried past the entrance before it could reach the shore.*"

The Lieutenant next proceeds to furnish a variety of extracts from evidence given before a Committee of the House of Commons appointed to inquire into the state of Dover Harbour. The evidence fully proves that the South-west winds are the cause of the formation of the bar at the mouth of the harbour. The following is from the evidence of the Hon. Captain George Elliot, R.N.

"[Ques. 1922.] The effect of the two piers, as at present constructed, is to act as it were *by suction* on the shingle, and to draw the beach into the harbour?—I think there are several things relating to the two piers, and more particularly to the western pier, which I should like to explain my feelings upon. The gales of wind at Dover generally blow from about west-south-west; but the sea rolls more in from the south, so as to come in from a south-west direction. At present the sea, striking the long face of the western head, rolls up obliquely upon it, and when it comes to the south-east angle, the change of direction is so small that it rolls readily round into the harbour: I may almost say the swell is guided round, by the formation of the head into the harbour. Of course the swell, on striking the pier, is to a certain degree retarded, and therefore the outer part of that swell advancing more rapidly, is brought round so as to roll more directly into the harbour, between the pier-heads. In passing the western pier-head in this way, the swell immediately between the heads is actually *greater* than it is *outside in the open sea*, and no sailing vessel can attempt to get out in what I should call *moderate* weather in a south west heavy swell, and even *steam-vessels dare not undertake it when the weather is at all bad.*"

The evidence of Captain Boxer contains many sound and useful practical remarks; and he is the only one who has given anything approaching to what we consider a *likely* remedy. We select the following passage from his evidence.

"[Ques. 1588.] Would you have the goodness to state to the Committee any observation you have made upon the different works that have been carried on since you have known the harbour of Dover?—I think it was in 1820 they commenced the plan of running sluices through the south head, and cut off a considerable portion of the outer harbour for that purpose; which in my opinion, has almost ruined it as a place of *shelter* for ships in bad weather; but I think it might be improved by running out the south head about 40 feet, so as to cover the north head and the mouth of the harbour from the heavy sea that breaks on it during heavy gales from the south-west, or by covering the mouth of the harbour by a *breakwater* of open piles."

We now come to the consideration of the author's *Plan for the construction of the Breakwater and Apron for the Sluices;* and here we must join issue with him, and point out what appears to us the utter impracticability of his scheme. We shall first give the construction of the breakwater in his own words.

The Breakwater is intended to be carried out 250 feet into the sea, and to be constructed of balk timber, one foot square, of a triangular shape, forming a multiplicity of triangles, each principal or triangle to be tied, or bound together by pieces of timber called whale pieces, four in number; and to be six feet apart, with a ridge purlin, two keels, and two keelsons to strengthen and shorten the bearings of the floor beams. Four tiers of cross tie beams, including those for the floor, are intended to connect the principals or triangles with the whale-pieces, by means of strong bolts, and strapped together at the exposed angles with iron.

The principals or triangular pieces to extend below the flooring or platform, in order to give it stability by penetrating the shingle, the inner ends to be longest where the shingle is deepest.

The inside of the frame work to be planked up with 3 inch plank; about 20 feet at the outer end, and 18 feet at the inner end, and to be caulked water-tight.

The breakwater could be constructed in two or three divisions, and floated out to its proper position, and grounded by filling it with shingle.

The end of the breakwater to be terminated in an oblique direction.

The frame work of the apron to extend to the end of the breakwater, and to be formed by driving piles, either of wood or iron, at proper distances, say 5 feet by 11, and covering them with iron or wood; to be highest at the outer edge, so as to form an inclined plane, both towards the breakwater and towards the sea.

The foregoing description of the construction of the breakwater is intended only experimentally, to show what might be done, and what the effects of the breakwater would be, without the apron, and sluicing power on the west side; as an experiment of the latter could not be tried without its being permanently established, though this would detract one-half from the value of the entire plan. I have given my attention to what might be done experimentally, at a comparatively moderate outlay, because it might be thought hazardous to establish a permanent work without trying what some of its effects might be; and if, afterwards, circumstances should induce the Harbour Board to carry out the other parts of my plan relating to the harbour's mouth, in a permanent work, I consider that the expense of the experiment, would not be thrown away, as the breakwater could be so placed as to form a shield, to protect and afford facilities which could not be obtained without it. On the other hand it may be thought, that there is sufficient evidence to justify a permanent work without first trying an experiment, and more particularly as a very valuable part of the plan could not be tried with the breakwater.

If an attempt were made to construct this breakwater, we very much doubt whether a second division could possibly be fixed before the first was carried away, even in very moderate weather; and we venture to say that if the whole of the experimental breakwater were by chance executed in a favourable season, the whole would be carried away by one of those South-westerly gales described by the witnesses in the evidence quoted by the author. If Lieut. Worthington had but read the description of the failure of the breakwater at Cherbourg, he would never have ventured on recommending his inverted cradle. He might have suggested a much better breakwater for his temporary purpose, by recommending the government to let the Commissioners have a worn-out sloop of war, which might be turned with its keel uppermost, and filled as the author directs, with shingle.

Lieut. Worthington next proceeds to give some *General observations on the principle of the plan*.

Having thus endeavoured to show generally the advantages of my proposed breakwater, I shall now endeavour to point out other important ones which would be derived from my other improvements, as well as the peculiar principle of my plan. But I must first premise, that my observations being intended for the general reader, I have endeavoured to make myself clearly understood, by avoiding the too frequent use of nautical phrases. This explanation I conceive to be necessary, because without it some of my nautical readers might consider that many of my explanations were altogether useless. I think it cannot be denied, that the extension of a breakwater 250 feet beyond the present pier heads, would of necessity shelter the mouth of the harbour—throw off the bay eddy at the extremity of the breakwater, and cause it to unite with the true tide, and thereby assist in carrying the shingle to the north-eastward of the harbour, instead of depositing it, as at present, in front of the north pier head. I ground this opinion on observation . for in no one instance that I am acquainted with, on our coast, does the shingle form a bar either at the extremity or on the east side of any projection into the sea. In proof of this position I beg to refer, as instances, to the Horn of Folkestone, Cheeseman's head, the Castle jetty ; and to those who remember their existence, I might also refer to the large groins which were formerly placed in our bay, of which I myself have a perfect recollection. The bay eddy would likewise be diverted in its course, and would improve the approach to the harbour, inasmuch as there would then be only one tide, or current, to contend with, instead of two as at present, by this eddy running past the mouth of the harbour, as far as Cheeseman's head ; and it is generally acknowledged by all acquainted with the present state of the harbour, that the two tides acting upon the starboard bow and larboard quarter of a vessel, render the approach to it extremely difficult, when it is required to bring her to a small helm and a steady course. My plan would also afford much more space for vessels when working to windward, in-shore, from the northward and eastward ; and allow them to make longer reaches to gain the harbour, because the bay eddy would be thrown off from the end of the breakwater into the true tide, and thereby give greater space for that purpose, when the eastern tide is running in the offing. This would also enable them to shoot or gain the harbour easier, as they would then have the assistance of the bay eddy.

The direction of the breakwater I propose, would be S. S. E. ; so that the end of it would bear about south from the north head ; and the fair way of the channel being about S. E. it would follow that a vessel could sail the harbour either way with two points to spare. This, therefore, shows that my breakwater would be no impediment to vessels getting in or out with such winds as serve them at present.

I would observe also, that the breakwater would be very useful as a turn water in sluicing from the mouth of the harbour; for as the shore naturally falls to the westward, the breakwater would act beneficially in stopping the progress of the water in that direction, and in confining it in a body, in a direct course till it reached the sea. It has been proved likewise by observation, that a breakwater sheltering the mouth of the harbour, would, in a very great degree, lessen the swell inside, as this has frequently been observed to be the result whenever a bank or spit of beach has been formed in the same direction as I propose to place it. * *

It may be urged by some, that by extending my breakwater into the sea, I should only remove the evil so much further out, and that a bar would form, with little variation, as it does at present in front of the north head. Others may contend, that by the action of the tide, the shingle would be carried rapidly past the harbour and clear of the bay altogether; but these opinions are so much at variance with each other, that the truth of either could only be proved by experiment. My own opinion, however, is different from either ; but supposing the effect of the breakwater to partake of both these objections, the result, in my opinion, would be this :—the beach would travel more rapidly past the breakwater, and progress in-shore in a more oblique direction, thereby clearing the mouth of the harbour, as will be shown by the map.

Another great advantage which would result from my breakwater, would be that by its being extended in a S. S. E. direction, the end of it from the north head bearing about south, would break all seas in its wake running from that direction, and to the westward of south. I have also heard it advanced, that it would be no protection to the mouth of the harbour, as the seas usually break at 90 degrees or perpendicular from the wind. In other words, that the seas would break right into the harbour, notwithstanding the protection afforded by the breakwater. This opinion, however, is so contrary to all experience, that I have little fear of its gaining ground amongst nautical men, though engineers and their assistants may endeavour to persuade themselves of its truth. * * The wind blowing from W. S. W. (the most stream wind) would cross the breakwater at right angles ; therefore I presume it would afford shelter during the gales from S. by W. to W. by S. the winds which cause the most sea. With a dead southerly wind there is comparatively little sea ; and with a south-easterly wind, though blowing hard, there is still less. * *

Another advantage that would accrue from the formation of the extreme end of the breakwater, I propose, would be, that it would be next to impossible for a sea to warp or wrap round it ; for in whatever direction it might be struck, the sea would be split, whereas the present formation of the south head, serves as a conductor to the waves directly into the mouth of the harbour. The battering sides of the breakwater, are also adapted to break the seas; for instead of their reflecting, they would have room to expand, and falling through the open work, the feather only of each wave would be seen.

Having extracted some of the principal passages contained in the work, and sufficient we think to give a good general idea of the "Proposed Plan," we will now proceed to state our objections to it. We feel fully convinced from the documents which we have read in the work before us, that the further the pier is extended, so much further will the beach be carried out;—to stop nature's works requires a giant's hand. According to all the evidence given, the beach travels from the West towards the East ; consequently where there are any impediments in its way, there it will collect, gradually shelving down to the foot of the obstruction, as in the case of a solid projecting pier. Thus what was deep water at the time when the pier was constructed, gradually becomes shallow. The beach is brought to the mouth of the harbour by slow degrees and in small quantities, and then washed up by the waves. At the point where the power of the wave is spent, there the beach gathers and forms the bar ; and this is the reason that the shingle does not form a bar at the extremity, where the whole power of the wave is brought into action to carry it away. To illustrate our opinion of the cause of the bar, we cannot do better than refer to the drawings given of Dover Harbour. Here it will be seen how nicely formed is the harbour for bringing the shingle forward to its mouth, where it may be forced by the waves into its throat till it be actually choked. And this will be the case still, notwithstanding any further extension of the pier, if it be not otherwise protected.

We have had no opportunity of surveying the harbour as our author has done ; but from the evidence which he has afforded us, we think we may presume to offer a few suggestions for the prevention of the bar and the improvement of the harbour. Whatever is done, no attempt must be made to prevent the progress of the shingle ;—for that is, in our opinion, impossible. It appears that the prevailing winds in this part of the Channel are from the South South-west, and that whenever it blows hard from this quarter, a very considerable bar is formed in the throat of the harbour. Our object then would be, to break the force of the wind acting in this situation. For this purpose we would advise an *open breakwater*, to be constructed of timber piles, as far out to sea as possible, and quite independent of the present works. This breakwater should be placed at right angles to the Eastern pier, in deep water, so as to allow vessels to pass round at either end, and leave a fair channel open between the breakwater and the mouth of the harbour. This would have the effect of breaking the force of the waves, and preventing their carrying the beach into the harbour ; it would also afford greater facilities for the entrance of vessels. If this were done, and found to answer the purpose intended, an extension of the pier might be made by constructing an open one of timber piles as described by Captain Boxer, where passengers might be landed at all times of the tide. If these works were executed, we have no doubt that the violence of the waves during a gale would be avoided both within and without the mouth of the river ; and that the shingle would travel past the mouth of the river unmolested, and without any danger of being driven into the harbour.

The Eccup Source dissected, and the Fallacies of the present Scheme for Supplying Leeds with Water more fully exposed, in a Rejoinder to Mr. Leather of Leeds. By Henry R. Abraham of London. April 1838.

We shall refrain from passing any observations on the Rejoinder before us, simply confining ourselves to making extracts, as we have done previously in relation to this controversy, in Nos. 8 and 10 of the Journal. We also omit some few remarks of the author, and alter one or two sentences which we consider of rather a personal nature ; and which would be better understood by those who are more immediately concerned in the discussion, than by the generality of our readers unconnected as they are with the town which has been the seat of the controversy.

Mr. Leather's pamphlet is divisible into two parts, one, and by far the greater, that in which he attempts, by an unfounded attack upon myself, to lead your attention away from the merits of his own plan, which alone is the subject of our inquiry—the other, in which he endeavours to support the fallacies of his scheme, by erroneous statements and loose analogies, instead of appealing to facts within his reach, which might, and ought, to have been ascertained by his own experience and observation.

I shall consider both these parts as concisely as possible, and use Mr. Leather as my evidence in both cases.

Part 1st—He begins, by stating that "I profess to prove the insufficiency of that source, which I not long since proposed as abundantly sufficient for the town."

This is entirely false.

My first, as well as every subsequent Report, limited the supply to the *domestic* purposes of 12,333 houses in the upper part of the town ; and I have uniformly stated, that only 650,000 gallons could be depended upon.

My Report not only stated this fact, but pointed out the source from which nearly two million gallons in addition, per diem, ought to be procured, and included also an estimate of the cost of such a supply.

The alleged difference of opinion between Mr. Marshall and myself, related principally to the outlay necessary for the purpose of the supply—that talented and lamented gentleman having expressed an opinion, that no supply could be effected without an expenditure of £250,000.

Mr. Leather again mis-quotes me on this point, and, with characteristic want of candour, conceals that portion of my Report which expressly relates to the necessity of an auxiliary supply. This Report was printed, and any mis-statement connected with it must have been wilful. It is likewise to be found in the Appendix B. And here I must appeal to the Editor of the *Leeds Mercury*, and solicit from him a corroboration of my statements. He knows them to be true; he knows, that so impressed was I with the necessity of increasing the supply, that at my own personal risk of cost, I undertook the survey of a district not included in my instructions, and that he most fairly exerted his influence to protect me from loss.

Mr. Leather next charges me with an error where none occurs; and in the same page actually adopts the very error for his own purposes. He states, at page 5 of his Reply, that I at one time named 230 gallons per minute, as the supply of spring water, and that elsewhere I state a much larger quantity. But I make no such contradictory statement—those differing quantities relate to different circumstances. These are my words in the one case: " At Eccup and Alwoodly, near Leeds, there *are springs of water* whose conflux yields a run of 230 gallons per minute, *independent of any assistance from rain*."

I then state, " That upon examining the account of the weekly gauges of the various springs which unite in Eccup Beck, *the fluctuation* appears to guarantee, at its minimum flow, a quantity equal to 432,000 gallons per diem."

It is obvious that the conflux of the springs in the Beck, is greater than the unvarying quantity gauged at the vomica or source of each spring, because, in the Beck, the rain is included and carried away. In the one instance there is a perpetual supply of pure crystal stream; in the other the polluted mixture of the combined springs with rain water, turbid with mud and soil, and discoloured by metallic and vegetable mixture, *fluctuating*, as I express it, with the fall of rain.

It is the measure of this fluctuation which affords the only indication of the available fall of rain, and yet Mr. Leather has never measured it. I shall recur presently to this important point.

The next occasion Mr. Leather takes to mislead, is, by misrepresenting my statements upon the subject of the evaporating surface of his reservoirs. He would lead you on to infer, that in stating the extent of evaporating surface, I took the area of the Eccup Reservoir only- he says not a word about his Oldman's Reservoir, of 9½ acres, nor of that most abominable project, the one on Woodhouse Moor. * *

I am next represented to have stated, that one-half the fall of rain will enter the reservoir; and Mr. Leather greedily fastens on the assumed admission to lend that support to his case which his own reasonings are incapable of affording. Unfortunately for him, my words are, *that considerably less than one half must be calculated*;—that *I* did not dare to expect that one-half would be obtained. * *

Part 2d—He states, that 31 inches rain, and 5 inches *dew*, form the average annual fall—that one half of this, or 18 inches in depth, is not only necessary for the town, but also, by a lucky coincidence, the precise quantity which will be caught in a reservoir. The remaining 18 inches is therefore required for natural purposes. But as he states 31 inches to be an average, then, necessarily, there are years in which the quantity of rain is much less than 31 inches; and indeed, we know there are instances of such falls as 18 inches only. On such occasions Leeds is to have *no water*—for nature will be served first. We know that falls of 20, 22, 24, and 26 inches per annum are common cases. In all such years, Leeds, by Mr. Leather's showing, will have no water; for, when the weather is thus dry, the evaporation increases beyond the mean of wet years, and Mr. Leather cannot keep a supply in store, because his quantity is shown to be no more than 1,333,800 per diem, and the town requires at starting 1,200,000. We will, however, suppose the alleged daily surplus of 133,800 reserved for a whole year, there is not then 120 days' supply of water, dregs and all, instead of 365 days' supply; so that, according to Mr. Leather's own statement, in all hot years, when the average of rain is lowest, and when water is most required, you will have no supply; and should two consecutive years of drought occur, the result would be dreadful, because six previous wet years could not provide a store of water sufficient for the demand.

Taking Mr. L.'s statement - that 18 inches of water, including dew, yields 1,333,800 gallons per diem, he will give the town 1,200,000 gallons per day, the rest, or 133,800 gallons per diem, he will keep in his reservoir, deduct his own quantity of evaporation, 4,260,168 gallons per annum, to make the whole calculation his own, and you will find that to fill his Eccup reservoir alone will take *five and a half years*, while to fill all of the three reservoirs it will take nearly six and a half years.† * *

Mr. Leather considers it *probable*, that the town, which in ten years time will require, according to his computation, 1,800,000 gallons per diem (but according to mine, and allowing only one-half the London supply, 8½ million gallons), may be supplied from the same source, which he now, from an 18 inch fall, calculates will only supply 1,333,800, if his most sanguine hopes are fulfilled. Will Mr. Leather perform this miracle of increasing the supply to meet the demand?—should he do so, he will have no water for his huge reservoirs, he will then have but a bare daily supply of thick-coloured water.

Yet again, in opposition to his own theory, Mr. Leather states, at page 10 of his Reply, that evaporation and absorption cause a loss of ten inches per annum (no matter what the soil, temperature, or locality), and that the excess of downfall above this quantity will be returned by the springs and living streams—so that 26 inches are returned, including *dew*. * * Does Mr. L. suppose that the living springs, in a particular district, owe their birth to the downfall of rain upon that district? There are hundreds of square miles in our country which receive as much rain, and more dew, than Alwoodly and Eccup, and yet neither springs nor living streams bless the district; but the soil is the collector for some more favoured, and in many cases, very distant tract of country. The springs of Eccup and Alwoodly, may be no more influenced by the rain which falls upon the district of drainage, than the fountain which plays in the Temple is by the rain which drops in Fleet street. * *

In the eighth Bridgewater Treatise, page 311, it will be found that instead of 26 inches of rain being returned to streams and springs, *only* 4 inches per annum flows to them. This is as stated by Dr. Thompson. It is obvious, if Dr. Thompson be right, your expenditure of £100,000 may redound to the benefit of Mr. Leather and some other persons.

We will, however, set the knowledge and authority of Dr. Thompson, as below the information and experience of Mr. Leather; and, *doubling* Dr. Thompson's quantity, will allow 8 inches, even then it is plain that Mr. Leather calculating that 26 inches is necessary, does not procure one-third the required quantity. * *

The whole fact is this. There are some springs which run the same quantity winter and summer, rain or dry—there is a brook, and only one little brook, which carries off all the rain which falls upon the district. The springs flow into this brook, and unite with the drainage. In fair weather, this brook is beautifully clear; in rainy weather, it is very muddy.

All agree that the springs alone run about 230 gallons a minute; and after a drought, that is about the measured quantity flowing through the brook. When the rain increases, the run of water in the brook is increased according to the violence of the fall, rather than in an exact proportion to the quantity of rain. A storm will suddenly charge the brook, while six times the quantity falling mildly, will have little effect; the ground, in the first case, is charged more suddenly than its porosity can carry away; while, in the other, saturation slowly occurs on the surface, next absorption through deeper soils, together with evaporation, slow or rapid as the case may be according to the condition of the atmosphere.

What then have we to do before we can justify the expenditure of £100,000? Put up a little trumpery pluviometer in Leeds, which may be disordered by a hundred accidental circumstances, and dispense with actual local observation and experiment? No! gauge the stream—see for one year how much water it produces, and form your calculations on the result. * *

Which is better, the result of three years' practical experiment and local observation, or an assumed conclusion of a downfall of rain from calculations made at distant places? * *

Read what Mr. Anderson states to be the available supply from the tract: " 436,000 gallons per diem, can, I have no doubt, be furnished."

Mr. Leather declares, 1,800,000 to be the quantity.

With, perhaps, less caution than Mr. Anderson, I stated, that a maximum of 650,000 gallons might be depended upon. Mr. Mylne, Mr. Jardine, and actual experiment have justified my report. On the other hand, here is your engineer, resident on the spot, who does not give you the results of any observations to prove the actual fall of rain which is the average of your district; but, supplying you with scraps of quotations from books, to prove the *average fall throughout England*, expects you to accept these loose computations, instead of that which he dares not give you; and yet this engineer alleges he has been employed nearly eighteen months in taking daily gaugings of the water. * *

In alluding to my remarks about the *dew*, utterly ashamed of having included it in his estimate, he says he never calculated upon the dew running into the reservoir. Hear his evidence and judge: " The fall of rain is 31 inches, and the dew 5 inches, *which gives* 36, *one half of which gives* 1,333,874 gallons per day." But the fall of rain may not be 31 inches for your district; for at Brandsby, near Leeds, 200 feet higher than York, in 1833, it was only 24 inches, and how much less in other years I know not. He states Wharfdale to be proverbially wet. A main tract of drainage generally is so, and to the disadvantage of converging tracts. Thus, in Alwoodly valley, the rain is most transient and sudden; the clouds are seen rapidly converging to their grand line of cumulation. The atmospheric changes and currents of air are violent and instantaneous; and, while on the northern aspect of the vale, the rain may be suddenly pouring, the southern may be, and is frequently, all sunshine. * *

One word as to the projected reservoir on Woodhouse Moor. Why are the best houses in Leeds, in the high district, to be deprived of a supply above the level of their kitchen-sinks, and to have water closets denied them? * *

The inhabitants of Leeds were stated by Mr. L.'s counsel to be about 150,000 in number. Mr. Leather makes it necessary that one-third of this population shall or must go without water. That third will be those who most require it—the Poor. He next states, that the remainder shall be supplied with water at the rate of 1,200,000 gallons per day.

CUBIC FEET.

† Eccup Reservoir	39¼	million, or about 246 million gallons
Oldman's	3¾	
Woodhouse (?)..	½	
	43½,	or about 271 million gallons.

This is not one-sixth the quantity allowed for a well supplied London district; and just *one-half* what the very worst supplied London district now has; yet one-third of your inhabitants are to seek even this little blessing in vain.

In ten years after the works are finished, when Leeds ought to have the benefit of water universally diffused, 210,000 persons, according to Mr. L., will require water. Of this number, if Mr. Leather's calculation of an 18-inch supply prove correct, one-half only will have water; if his high probability turn up well, two-thirds will be supplied: but, in both cases, with only one-half the quantity given to the worst supplied London district. Now, such is to be the supply, even if Mr. Leather succeed in obtaining all the water he chooses to anticipate. * *

I will now show you that even the promised supply, inadequate as it is, will never be afforded. There is not the water for you.

	ns per diem.
The springs of Eccup yield, per diem, not more than -	333,000
Accurate gaugings of the Eccup Beck, during three years, show that the 1,200 acres of drainage will supply, in its natural percolation, about - -	200,000
But it is presumed, that by care, a larger supply may be obtained; and that although the Beck only indicates 200,000, we may add, for escapes, &c.	

Now this is the practical working of the problem; and if you get as much water as this you will be fortunate. The vessel in which this is measured stands before you. Go to Eccup, and judge for yourselves—ordinary observation will detect the fallacy. * *

The pure spring water should be delivered to you fresh from the springs on alternate days, as I proposed; you would then always have delicious water to drink and cook with. - Mr. Leather mixes it with drainage water.

On the other days, your rain-water supply should be served, and after standing a certain time to deposit the dirt from the lands, this would be received into a separate tank or cistern, for household purposes. Read what Mr. Leather does with this delightful spring water. He pours it into a reservoir with an earthy clay bottom, which never can be properly cleaned out, and mixes it with the rain as it falls, and without any provision for filtering that which he pollutes, sends it diurnally, thick and muddy, to Leeds. No water which flows over fallow, or loose soiled cultivated districts, is fit to drink until about thirty, or more days (according to the weather), after the fall.

A Practical Treatise on Rail-roads, and Interior Communication in general: containing numerous Experiments on the Powers of the improved Locomotive Engines; and Tables of the comparative Cost of Conveyance on Canals, Railways, and Turnpike roads. Third Edition, with additions. By NICHOLAS WOOD, Colliery Viewer, Member of the Institute of Civil Engineers, &c. London: Longman and Co.; 1838.

This is the only treatise with which we are acquainted that enters fully into the history, theory, and practice of Railways; and its utility appears to be very extensively admitted, and very firmly established. A work of this nature, treating of a subject of great and growing interest,—a subject likewise on which observation and experience are daily accumulating new facts,—seems necessarily doomed to one of two fates. If in its original form it be really worth little or nothing in itself, it will die a natural death in its first edition, notwithstanding the interest of its subject. But if to begin with, it be in any degree worthy of its subject, successive editions will give its author successive opportunities of amending, enlarging, and renewing his work that it may constantly keep pace with the march of improvement in the art or science of which it treats. By appearing now in a third edition, Mr. Wood's book proves itself to belong to the latter class; and it has partaken largely of the additions and improvements of which we have said that works of that class are susceptible. We remember it in its youth, slim and slender like a growing lad; then again,—we suppose we must say on attaining its majority,—with its figure well filled out, and its form that of a full-grown book; and now its proportions grow most Justice-like, and we find it as it should be,

"Full of wise saws, and *modern* instances;"

the author will take care, we doubt not, that we shall never have cause to pursue the quotation further and lament over the

"—— big, manly voice,
Turning again toward childish treble.—"

Mr. Wood, as he states in his introduction, has in the present edition availed himself of the valuable information given by M. Pambour in his work on Locomotive engines. He has further had recourse to Professor Barlow's experiments and calculations on the strength of rails, for information on this important subject. And the practical experience of seven years of regular and constant traffic on the Liverpool and Manchester line, has enabled him likewise to enrich the new edition with various interesting and important particulars respecting railway conveyance, both in itself considered, and as compared with other modes of locomotion. We shall endeavour to give a general notion of the contents of the book, making a few observations and extracts as we proceed.

The first chapter briefly describes the nature of *Internal Communication* in general. To begin from the very beginning, we have one short section on pack-horses, and another on military and turnpike roads;—which are all very well, for the time seems to be coming when these things shall be of the things that were, and a knowledge of them be preserved in books for the information of the pains-taking Dryasdusts of a future generation. In the third section, the author endeavours to trace the origin of railways in Great Britain; and under this head we find some curious and interesting matter. Mr. Wood considers that they were first introduced at Newcastle-upon-Tyne, between the years 1602 and 1649, probably a considerable time prior to the latter period. These earliest railways were of timber, with longitudinal sleepers and cross ties; somewhat similar to the construction which some of our modern railways are adopting, with the addition of wrought iron rails. The next improvement is stated by our author, to have been the substitution of cast iron rails for wooden ones, which appears to have taken place between 1738 and 1768, the latter being however the more probable date. Malleable iron rails, we are informed, were first tried about the year 1805; but their use was very limited until 1820, when

Mr. John Birkinshaw, of the Bedlington iron-works, obtained a patent for an improvement of their form. Previously to this, their section was rectangular; and either the narrowness of their surface produced great injury to the wheels, or, by increasing the breadth, the sectional area was increased, and consequently their cost became so great, as to exceed that of cast iron, and thus cause the latter to be preferred. Mr. Birkinshaw produced a rail, which combined the same bearing surface as the cast iron rails, with that form which likewise exhibited the greatest strength, and thus obviated the objections to the use of those rails. Varius modifications of Mr. Birkinshaw's form of rail have since been adopted, but this principle of manufacture now forms the description of rails most generally used. Their safety, in rapid rates of travelling, renders the use of them almost indispensable; and they have, on that account, entirely superseded the use of cast-iron, on all public railroads.

The fourth and last section of chapter I., traces in like manner the history of Canals.

The attempt to form the Sandy Brook into a navigable canal, from the river Mersey to St. Helens, in Lancashire, in 1755, appears to have been the first of the kind in England; and since that period, they have been extended into almost every quarter of the island. Such was the rapidity of their extension in England, that, between the years 1760 and 1803, no less than 2292 miles of canal were opened. * *

At the time of the publication of the first and second editions of this Work, scarcely any experiments had been made on a large scale, to elucidate the capabilties of canal navigation,—none, certainly, satisfactory; since then, the competition of railways has aroused the dormant spirit of the canal proprietors, and various experiments have been made, to ascertain the amount of resistance of boats dragged at different velocities; attempts have been likewise made, to adapt the power of steam to propel the boats upon them, and other expedients have been adopted, to increase their activity, as a mode of traffic, and especially for the conveyance of passengers. So far as we are able, and with the information which a restricted inquiry has enabled us to acquire, upon the subject of so important a question; it will be our duty, to place those modes in competition with each other, before the public fairly and impartially.

The second chapter is entitled, *Description of Rails and progress of Railroads.* It describes the various forms of rail that have been in use in England from the first introduction of railways to the present time. It institutes likewise, a comparison between the advantages of cast and wrought iron, and between the properties of edge and plate rails.

Chapter III. is *On the Strength and Stiffness, and best Form of Section of cast and malleable iron rails.* The author gives various statements to show the annual wear of wrought iron rails, from which he draws the following conclusion.

We may, therefore, take the wear of the rails to be about one-tenth of a pound per yard per annum, which, supposing the whole to result from the wear, on the upper surface, will be one eighty-fourth part of an inch; if the top, or wearing part, of the rail were therefore an inch in depth, the rail would wear eighty-four years. The whole of the wear, above alluded to, does not however take place upon the top; a part, though probably a very small portion is attributable to exfoliation, by the action of the air: supposing, however, that the wear, by the action of the wheels, amount to one-tenth of a pound per yard per annum; if the top, or bearing part of the rail, be made an inch in depth, it will be sufficient for all the purposes required. Any increased depth and weight, which would not be required for above eighty years, would, at compound interest, at the end of that period amount to a greater sum than

it would be expedient to expend for such a purpose, considering the remote period at which it becomes useful.

This chapter contains thirty-five tables, exhibiting the results of numerous experiments on the strength and rigidity of rails of various shapes and qualities of iron.

The fourth chapter will be found particularly valuable by the engineering student. It treats very fully of *the Formation and Construction of Railways** from the first setting out of the line, to the laying down of the rails; with practical directions for the widths of the roadway, the depths of the metalling to be laid on the surface, the proportions of the slopes of the cuttings and embankments, the method of drainage, &c. We fully concur with Mr. Wood in his remarks under the head of "width between the rails," respecting the want of judgment shown by the legislature in abandoning the standing order for regulating the construction of railways in this important particular.

It is impossible to conceive the confusion which may be the result of this departure of the legislature from a standard width for all railways; especially if railway companies and engineers follow the dictates of their own opinion, without reference to the general convenience of the public. The delay, expense, and inconvenience of changing from a line of railway of one width to another of a different width, where despatch and rapidity of travelling is the great characteristic of the system, must be inconceivable. It is due to the public, that a full and comprehensive inquiry should be instituted by the legislature, to determine the proper width now to be adopted; not only with reference to all railways to be made in future, but likewise with reference to those already made; and when a conclusion is come to, and the best width, under all the circumstances, determined upon, it should be made a standard in all railway bills, and should not be allowed to be departed from, under any pretence whatever.

Without presuming to determine upon so important a question, on which there is a great difference of opinion amongst engineers, we shall for the present assume the width between the rails to be four feet eight inches and a half. The breadth of the bearing part of the rails cannot vary much; about two inches and a half seems to be the width agreed upon by almost, if not all, the engineers of the different lines of railway in England. The width between the outside of the rails will therefore be five feet one inch and a half; or five feet one inch, if the breadth of the rail itself be two inches and a quarter.

The following description of the mode adopted by Mr. Stephenson for carrying the railway over Chat Moss on the Liverpool and Manchester line, will be found interesting, as showing how easily this at first sight insurmountable difficulty was overcome. We remember to have heard it stated in Lancashire, that the line over Chat Moss was proposed by the powerful opposition which beat the Company from the line first designed, nearer to the old turnpike road; they thought thus to *swamp* the railway altogether,—but in those days it had not been seen what a Stephenson could do towards surmounting apparent impossibilities.

The modes of passing yielding ground, mosses, or bogs, adopted by some engineers, may however be described in this place, and the Chat Moss, on the Liverpool and Manchester railway, being the most extensive moss yet passed over, we shall give the plan adopted by Mr. Stephenson, for carrying the railway over this moss.

This moss is of considerable extent, comprehending an area of about twelve square miles, being of so soft and spongy a nature that cattle cannot walk upon it, and an iron rod sinks with its own weight. The depth varies from ten to thirty five feet, resting on clay and sand. The distance which the railway was to be carried over it, was upwards of four miles and a half, an undertaking which required some degree of nerve to contemplate. It is necessary to premise, that in carrying the railway across the moss, the level required that it should in some places be twelve feet above, in others nine feet below, and to vary from these to level with the original surface of the moss. We have, therefore, three distinct operations, viz., *embanking* the railway above; *forming a cut below*; and forming the road *level with* the moss.

ng the Railway above the Moss. There is another moss, of considerably less extent than this, over which the railway passed, and which, at one end, was terminated by an extensive cutting of clay and gravel. As an embankment of four feet in height had to be formed over this moss, the materials from the excavation were used for this purpose. The moss was about twenty feet deep, and it was soon found, that as the materials were successively laid upon the moss the whole mass gradually sunk; and when the embankment was finished, although the actual level of the railway was only four or five feet above the original surface of the moss, the quantity of the metal deposited would have formed, on ordinary ground, an embankment twenty-four or twenty-five feet high; with such materials, therefore (clay and gravel), it would have been impossible to form an embankment over Chat Moss. The quantity required, and the consequent expense, would have been enormous. Mr. Stephenson had recourse, therefore, to the moss itself, for materials to form the embankment, which, by its inferior specific gravity, would not sink to such an extent as gravel and clay. In its natural state, the moss was unfit for this purpose; but drains were cut, five yards apart, which laid the moss between the drains dry, and rendered it excellent material for the purpose. With this material, embankments were formed upon part of the moss, and it was found to require only about four times the quantity of material that would have sufficed for sound ground, and the road appears in quite as good order as in any other part of the line.

Forming a cut below the level surface of the Moss, was accomplished entirely by draining; the drain was cut along the line of the railway, eighteen inches to two feet deep, which laid dry that portion of the moss between them. About twelve inches in thickness thus dried, was excavated at a time; and it was in that manner successively drained and excavated, until the proper depth was obtained. The permanent road was then formed in the manner hereafter described.

Laying down the road upon the surface of the Moss. Drains were first of all cut on each side of the line, and lateral ones, where necessary, to carry off the water. By this means, a certain depth of moss on the top was partially consolidated, and formed a layer or surface of dry moss, of considerable tenacity; upon this, hurdles nine feet long and four feet broad, wickered with heath, were laid down transversely. In many places, only one layer of hurdles was required; but when the moss was very soft, two layers were used. Upon this was laid about two feet of ballast, or gravel, to form the permanent road; and wooden sleepers, stretching across each line of road, were used to lay the rails upon. The stability of the road, therefore, depends solely upon the tenacity of the materials, supported by the buoyancy of the moss. When we consider, however, the area of the base thus firmly united and bound together, and the support which even so spongy a substance as the moss must give to so extensive a platform; it is natural to suppose that the impression made upon so great an area, by the pressure of so inconsiderable a proportion of the whole weight as that of a train of carriages, must be slight indeed; and we find, that since the opening of the railway, the passage of the traffic over the moss proves that the road is exceedingly stable. It may be necessary to remark, that the surface of the moss is higher than that of the country bordering its edge.

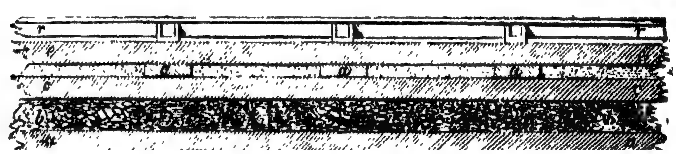
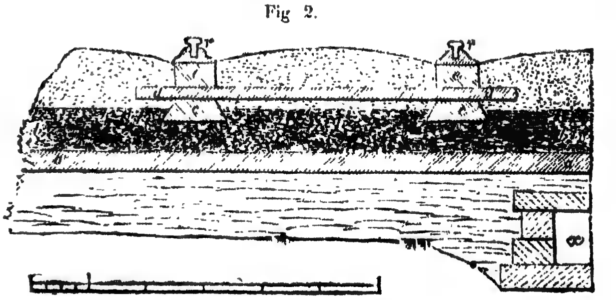


Fig 2.



Scale of Feet.

Fig. 1 is a longitudinal, and fig. 2 a transverse section, showing this mode of forming a railway over a moss; *a a* are the hurdles, or wickered foundation, which may either be single, or two or three layers, according to the tenacity of the moss; *b b* is the coating of sand or gravel, resting upon the wicker work, small branches of trees, brushwood, or furze, being laid down upon the hurdles; upon this gravel, either longitudinal sleepers, *c c*, are laid down, with transverse sleepers, *d d d*, laid upon them, or transverse sleepers, without the longitudinal ones, according as the moss may require.

The longitudinal sills, *c c*, are then laid along the transverse sleepers, upon which the chairs and rails are laid down in the usual way. A moss has been passed, in the manner shown in the above figures, upon the Garnkirk railway, near Glasgow, by Messrs. Grainger and Miller.

The subject of chapter V. is the *Construction of Carriages adapted to railroads*, in which will be found a description of various recent improvements in the construction both of goods-waggons, and of passengers' carriages.

We are obliged to defer any further notice of this work till next month, when we shall resume our review of it. Meanwhile, we confidently recommend it to the continued favour of the profession, and especially to the notice of the engineering student;—his library indeed cannot be said to be complete without it.

appears inconvenient and disagreeable. *Railway* seems now we think the more usual term; though we perceive the late parliamentary report adheres, as legal documents usually do, to the older word, which in this instance is *railroad*.

The Book of the Grand Junction Railway, forming a Guide from Birmingham to Liverpool and Manchester. By THOMAS ROSCOE ESQ. assisted by the Resident Engineers of the line. Illustrated by steel plates. Part I: London; Orr and Co.

This work, as stated in the prospectus, will be completed in about six parts, each part containing three engravings. The plates in the number at present before us, are neatly engraved, comprising some interesting portions of the railway and the line of country through which it passes. We are however disappointed with the letter press, which is very meagre, and deficient in new matter. One half of it is occupied by an introduction very little to the purpose; and when we come to the first chapter, we find it mainly consisting of an account of the engines which were entered for trial for the prize offered by the Liverpool and Manchester Railway Company previous to the opening of their line,—a subject which has been treated in print over and over again. We should have expected that the author, assisted by the resident engineers of the line, might have found more important matter to fill the scanty space allotted for the letter-press in this his first number. The materials, we are convinced, are ample; and we hope that the next part will offer a more favourable sample of the work, than the present.

LITERARY NOTICES.

A new edition of *Sir Henry Parnell's work on Roads*, is just published. It appears to have received considerable additions; but having been unable to find either time or space in our columns allotted to Reviews, to give it the attention which it claims, we have thought it better to defer the consideration of it to our next number.

Mr. Weale has brought out *a New Theory of the Steam Engine by the Chevalier G. de Pambour.* This treatise seems to embody the valuable papers on the subject by the same eminent author, which appeared in Weale's Scientific Advertiser. We are glad to see them in this more permanent form; and we shall notice the work more at large on a future occasion.

The Railway Company's, Engineer's, Contractor's, General Builder's and Manufacturer's Labour wages tables, by E. Perkins. London: Effingham Wilson. A ready reckoner for wages, printed in a remarkably bold, posting-bill kind of type. For our own part, we should prefer a smaller type and a smaller book; but there may be others to whose failing eye-sight this feature of the work may recommend it.

ORIGINAL PAPERS, COMMUNICATIONS, &c.

RALPH REDIVIVUS—No. 8.

THE RAILWAY ENTRANCE, EUSTON SQUARE.

Just as this article was about to be put into the hands of the compositor, a letter, signed "Omega," was placed in my own, which I will therefore take the opportunity of here noticing. The writer expresses himself so obscurely that it is quite impossible to make out the meaning of some of his paragraphs; but the purport of the whole is plain enough. He is exceedingly wroth with Ralph Redivivus, and perhaps not without sufficient cause, since it is very possible that he may be some party more than ordinarily interested in what I have said; and may, therefore, have despatched an anonymous letter to the editor, hoping that I shall be roughly taken to task by him for injuring the character of his "valuable journal," in the estimation of such persons as "Omega." I say anonymous letter, because it is altogether differently circumstanced from an article intended for insertion in the Journal, with a fictitious signature attached to it. Any one, except "Omega" himself, must at once see this; and that it would be utterly impossible to conduct any periodical whatever, were an editor to attempt to steer his course according as he may be directed by any or as many individuals as may—for some purpose of their own—think fit to set him right.

His letter is a direct attack upon a series of articles that, while it continues, constitutes a feature in this publication. Nevertheless, he thinks he has only to express his decided disapprobation of "such like things," as he elegantly phrases it, and the Editor will out of complaisance to one who conceals himself behind a mask, immediately alter his arrangements, and forthwith suppress what does not happen to be to the taste of an individual.

That my lucubrations would please every one, I never imagined: for I am perfectly aware that they contain many opinions, both general and particular, that must be positively offensive to many, and prove so in proportion as they are felt to be advanced with ability, and to contain some sound stuff in them. Feeble, nerveless, and unmeaning, must that criticism be, which endeavours to propitiate all by displeasing none; and I am tempted to entertain a better opinion of my papers, and even feel increased confidence in myself, when I find that I have made such a person as "Omega" shows himself to be, squeak out piteously against me. "All R. R's. papers," he says, "are *trash*;" which it must be owned is a conveniently summary way of deciding the matter; as it saves all trouble of attempting to bring forward any specific charges. I do not in the slightest degree question his sincerity; yet I may be allowed to hint that it is strange that such being the case he should have forborne so long, instead of cautioning the editor against such trash, immediately after the first specimen. Or how happened it that if he entertained so very mean an opinion of the first two or three papers, he should have continued regularly to peruse them, to the waste of his precious time, and the ruffling of his temper? After this I may be forgiven for imagining that there must be something or other so unusually attractive in them, that "Omega" was fascinated to read them in spite of himself. In calling them *trash*, therefore, he libels his own taste; because, did he consider them to be such, he had ceased before now to bestow any notice on them.

All this leads me strongly to suspect that there must have been something in my last paper that especially annoyed him, and caused him to resolve manfully to make his complaint to the editor at once; still he might as well, while he was doing so, have said where the shoe pinched him. Yet instead of speaking out intelligibly, he has strung together a set of vague paragraphs, so disconnected and indefinite, that it is impossible to perceive their drift. In one of them he says—"It should be explained, why to examine critically the Post Office, it is necessary 'to cross over or go round from Goldsmith's Hall!'" I am sure nothing further than this is necessary to explain what a blunderer "Omega" must be. Who ever said or thought, that in order to examine critically the Post Office, it is *necessary* to go round from the other building. Certainly not Ralph Redivivus. But there are some matter-of-fact individuals, who cannot comprehend any thing, if it be not expressed in the most ordinary way. To every one else it must be evident enough why I spoke of going round from Goldsmith's Hall to the Post Office; namely, because the first mentioned building had formed the subject of my preceding paper.

Perhaps I have bestowed far more notice upon this matter than either it deserves in itself, or than is altogether becoming on my part. It gives me however the opportunity of saying once for all, in the editor's name as well as my own, that those who do not relish these papers, must pass them over:—and in every periodical there will inevitably be something that is not equally to the taste of all readers. Should any one, however, think fit openly to controvert some particular remark or point of criticism in these papers; I make no doubt but that the editor will allow him to state his arguments as fully as he pleases; and as for myself, I can promise that I shall not be found backward in taking the field against such an adversary.—Come on, Macduff!

Leaving to others the liberty of attacking and combating my opinions, I assume to myself the right of promulgating them. Accordingly, in my last paper I spoke out very plainly against that system of servile, pedantic imitation, which prevails in regard to copying Grecian columns and entablatures with hair-breadth exactness,—which would proscribe all invention as innovation, and all innovation as downright enormity. What then am I going to say of a structure which aims at giving nothing more than a Doric propylæum? To abuse it heartily? To rail at it in good set terms? So far from it, that I readily admit I admire it as being a very noble architectural object. In so doing, I must further admit that I am grossly inconsistent. Not at all: the thing itself makes no pretensions to originality of design, but shows itself most undisguisedly to be borrowed from the antique. This is not a case where while particular parts are scrupulously copied from the antique, the expression of the ensemble is altogether foreign to it. On the contrary, the imitation here observable, is legitimate, and no more partakes of plagiarism than does a translation of Homer or a cast of the Laocoon. With the precise forms and arrangements of Grecian architecture, we have here its spirit likewise; and that also to the exclusion of anything interfering with it. Nor that alone; but we here behold the full majesty and severity of the order exhibited upon a scale that renders it truly imposing. Till now, we had nothing that could convey an adequate impression of the majesty of a Doric portico; for if not diminutive in themselves, most things of the kind have been made to appear so in comparison with the masses to which they are attached; and failing to satisfy the eye by grandeur, they look, for the most part, affectedly harsh and cold, particularly when compared with other parts of the same design.

In this entrance, on the contrary, we are made sensible of the full

effect of the order, without there being anything to disturb our satisfaction. We have the effect not only of magnitude, as well as of forms, but that also arising from breadth of light and shade, heightened by that of great depth, and the contrast of perspective; so that, although each front consists merely of a distyle in antis, yet as the columns belonging to the hinder one are seen beyond those in front, and opposed to them in colour, accordingly as the sun happens to strike either upon the former or the latter, very great richness and picturesque vigour are combined with great simplicity. Not only do the further columns serve to fill up to the eye the intervals between the nearer ones, from being shown within the same space, where there would otherwise be only two; but their position seems to change according as the spectator shifts his station from one side to another,—advances to or retires from the front. Wherever there are striking effects of this kind—which may be understood to exist, from what is shown in drawings and views, yet cannot be represented by them—architecture seems to acquire motion and life, nor are they the less valuable because they cannot, like decoration, be introduced ad libitum, but depend upon circumstances that very rarely favour them. All the more desirable is it therefore that whenever an opportunity does present itself it should be made the most of; that is, made as much of as the subject itself will allow. Instead of which, so far from catching at such opportunities, architects appear to shun them, and to study nothing so much as to avoid the species of originality that might be derived from perspective combinations. Of this we have striking proof in the Post Office; where notwithstanding that the plan most forcibly suggested that the portico and hall should conjointly be made to form an uninterrupted vista through the centre of the building, which might have been accomplished without further variation of the actual plan than the slight one of substituting two columns in lieu of the large door, between the antæ on the wall which now entirely divides the hall from the portico,—the architect preferred adhering to what in general cases is done out of sheer necessity. There was an opportunity which a man of original talent,—I might say a man of classical taste,—would on no account have let escape him. And how captivating a picture such an extensive open atrium would have formed, where the lines of the inner columns would have exhibited themselves so piquantly behind that of the external colonnade, must be obvious, I should conceive, to even the dullest imagination. Nevertheless, it would perhaps be expecting too much, to expect that on any one occasion Sir R. Smirke should deviate from the settled track; for his designs partake one and all of what the Germans term Schlendrian.

Although in itself a digression, yet as what I have just been saying serves not only to supply a remark omitted in my last paper, but also to illustrate my present subject, I will not pretend to apologise for it. In fact the apologies employed on such occasions, are mere unmeaning forms, childish make believe; for if they be sincere, the writer confesses himself to be an ass, begging pardon for the impertinence he might cancel by drawing his pen through it.

Of porticos we have examples enow already; since each additional one does little more than increase the number, without exhibiting any marked peculiarity of design, difference of character, or difference of scale. The more readily therefore do we welcome this Doric propylæum, which for the scale upon which the order is executed so greatly exceeds every other specimen of Grecian architecture in this country, as to be on that account alone conspicuously distinguished. Except St. Paul's, where the magnitude of the entire fabric greatly takes off from the apparent size of the columns, we have scarcely any in the metropolis which exceed thirty feet, a height in comparison with which that of those in some of the public buildings abroad, becomes gigantic. Even those of this railway entrance, although forty-eight feet high, would appear more remarkable for bulk than loftiness, beside those of La Madeleine, at Paris; and the whole propylæum would look very moderate in size, if it could be viewed together with such a colossal mass as the Arc de l'Etoile. Measured however by the standard of our English buildings, it becomes in its turn colossal, and has the air of being not only a public, but a national monument; and is many degrees superior in taste as well as in imposing grandeur of scale to the celebrated Berlin Propylæum called the Brandenburg Gate. In general design it bears a close resemblance to the Porta Ticinense, or di Marengo at Milan*, erected by Cagnola; which also consists of two fronts, distyle in antis (of the Ionic order) connected by lateral or end walls. Yet there those last-mentioned parts are pierced with a lofty arch, which openings, besides seeming quite uncalled for as entrances, detract from the expression of solidity; whereas our railway edifice is indebted for much of the nobleness of its character to the depth of surface it presents on its sides, both as seen through the columns and beheld externally. In fact, a good deal of its beauty is lost in a direct view, were it only because such view excludes some of the most striking embellishment,—indeed, I might say all of actual decoration introduced into the architecture,—namely the series of large heads in the cymatium of the cornice on the sides of the building, and the range of antefixæ above it; which together give a richness and finish to this specimen of Grecian Doric, very superior to that of any other imitation of it we possess. Therefore, although very well executed and otherwise conveying a very correct idea of the design, the lithographic view of this Railway Entrance, being little more than a perspective elevation, by no means does justice to its actual appearance; but on the contrary, keeps quite out of sight the most remarkable particulars of detail. Yet it is precisely to beauties of this kind that public attention requires to be directed; for they it is which give fidelity and spirit to what, but for them, is but an imperfect and maimed copy of the professed original. If we must be imitators, the least we can do is to take care that we do not omit those graces which constitute the finishing touches of architecture; as ornaments indeed superfluous to the building, but at the same time so indispensable to the design that unless they are introduced, some equivalent ought to be substituted for them; or if that cannot be done, the whole ought to be so recast as to disclaim imitation altogether. As the building is not quite finished, and as I have also left many particulars unnoticed, I may, perhaps, return to the subject in some future paper. Yet promises being—as every one knows—confoundedly brittle things, I make no positive one to that effect. In the meanwhile I leave my readers to chew the cud of the following piece of genuine Carlyle-ism: "all criticism that does not go forth from a creative re-conception and re-organisation of the thing criticised (to which a principle of sympathetic vitality in the critic belongs) is worse than nothing, or vanity. It is an ill-natured, or at least an idle bird, pecking at berries which it cannot eat."

THE PARKS AND METROPOLITAN IMPROVEMENTS.

"I never knew any good accrue from doing more than one thing at a time," was the emphatic observation of a learned and noble lord a short time since; and with the axiom, from so great an authority, yet ringing in our ears, we are desirous of continuing and bringing to a conclusion, and we hope, of exhausting the subject of our *national monuments*.

We think we have with us the general opinion, that bronze is in reality the least durable of materials for such purposes, and that a statue easily overthown or easily converted to other forms and uses, is equally inappropriate. We have not assumed a fact and then argued upon it; we have brought forward our authorities, the experience of all times, of the plunder of all ages and under every variety of circumstances, and from that experience we have deduced our conclusions.

"Exegi monumentum ære perennius"

was the boast of Horace, whose prophetic vision taught him the fleeting nature of the immortality bestowed by the statues that were starting up at every corner of the streets of Rome, to the memory of statesmen and conquerors. How truly the prophecy has been verified this inquiry has fully shown.

But it will ever be the desire of man to place upon record the gratitude he feels to his benefactor by some visible object, and to relieve himself from the load that oppresses him by exhibiting some public testimonial; and although the moment of enthusiasm is scarcely the time for a careful investigation of the most proper mode of performing this duty, it is nevertheless not the less necessary; and we are therefore inclined to enter more fully into the subject in the hope of fixing some certain data upon which we may in future proceed.

To attain this object, we must pass before us the descriptions we have of monuments that have been erected to perpetuate the fame of heroes, kings, or statesmen. Of these, the most ancient are the obelisks of Egypt; and thence gradually approaching our own time, the monuments of Greece; the triumphal columns and arches, and the

* Speaking of this edifice the author of "Notes Abroad," (a work abounding in clever and original architectural remarks) says—"Although there is a degree of Grecian simplicity and gracefulness in this structure, very unusual in Italy, there is also the decided impress of the Italian school: the capitals are meagre compared with those of the Grecian Ionic, and their want of bulk and depth occasions the columns themselves to look disproportionably tall, and tall they would be were their shafts reduced by deep capitals and neckings. Again, the capitals of the antæ or pilasters are similar to those of the columns, which might not have been so objectionable, had the angular volutes been turned diagonally. Probably the architect was unwilling to appear to innovate too much, and therefore made a sort of compromise with the taste of his countrymen; and considering what exceedingly grotesque fancies the eye is accustomed to in Italy, the whole of this design must be allowed to be exceedingly chaste."—Vol. I., 248.

tombs of Italy. For the better consideration of our subject we will divide it into two parts; giving our first attention to those objects which whether in marble or stone (bronze being with us quite beside the question) are so defaced, or so converted to other uses, as to have lost all trace of former beauty and original appropriation; and next, to those whose existence still attests the glory of the persons to whose honour they were erected, and which consecrate the historical facts they represent.

Of the first class are the tombs of Augustus and Hadrian at Rome. The plunder of nations was lavished upon them; and their great originators confidently relied upon their preservation for posthumous fame. The descriptions by ancient writers attest the elegance and richness of these mausoleums; doubtless it was expected that even the barbarian hand would shrink from the disgrace of injuring so much beauty. But ask at this day of the passing Roman the occasion of the erection of these edifices, of which the ponderous remains yet encumber the earth. He knows the one only as a fortress that awakens all his fears; and the other as the scene of his present frivolous amusements. The castle of St. Angelo awakens no recollection of the glories of Hadrian; and the area dedicated to "le giostre" and the exhibition of fire works, calls up no patriotic feeling for the memory of Augustus. Could their immortal spirits witness this desecration of their tombs and the degeneracy of their descendants, could they know that the sumptuous pile which they had looked upon as the safe receptacle of their mortal remains, and the visible object of a people's admiration to all distant times, should not even convey their names to posterity but through the medium of the antiquary,—how would they grieve at having thus employed the plunder of the world, and for such purposes taxed the genius of their most able architects.

But we think we can discover the cause of this destruction in the size and nature of the buildings. Too large to be suffered to remain useless, and their parts too numerous and too serviceable to remain inviolate, they have been robbed of their characteristic enrichments to adorn other erections, and their bulk has allowed them to be converted to other purposes. We cannot therefore too strongly impress upon our readers, the great mistake that either bulk or solidity will insure durability; in the sense in which we would now regard it, these two qualities are essentially opposed to it. We never see the colossal arch at Hyde Park Corner, but we imagine the hero of a hundred battles from his mansion opposite regarding it as a good position for a battery; and contemplating the command it must give in the event of foreign invasion or civil commotion, of the several roads and large open spaces by which it is surrounded. We can imagine too, with what little ceremony he would under such circumstances tumble over an equestrian statue he might find thereon, encumbering his position; and plant his cannon in its stead. We know that Cleopatra intrenched herself in one of the gates of Alexandria; and several of the triumphal arches of Verona appear to have been chosen, from their strength and position, for fortresses. To make these erections available, they have been perforated by the besiegers for the purposes of musketry; and the assaults of the besiegers have removed every vestige of art or ornament from their surfaces.

It would be useless and tedious to carry this part of our subject further;—let us therefore now apply ourselves to the consideration of those monuments, which after the lapse of ages still convey in intelligible terms the cause of their erection; and inquire why in the midst of the ruin that surrounds them, they alone have escaped destruction. Of these the most ancient are the Obelisks of Egypt. Formed either of granite or porphyry, the hieroglyphics cut slightly into the surface, they are by the researches of modern science as intelligible now as when first erected, and the volume of four thousand years ago is opened to our times.

Next in order are the monuments of Greece. Of these the most perfect are in Athens, a city often overrun by civil commotion, at length laid prostrate under the galling yoke of foreign enemies, and retained for centuries in the most oppressive slavery. Yet at this day may be there seen, the Choragic monument giving immortality to Thrasyllus by whom it was dedicated, and to the several other parties who assisted in the ceremonies; while the date upon it, cut with the several inscriptions into the marble, fixes its erection at three hundred and eighteen years before the Christian era. The Chroragic monument of Lysicrates, by the same means brings before us at a distance of more than two thousand years, the names of Lysicrates, Theon, Evaenetes, Lycidas; placing them on the same base with Demosthenes, Apelles, and Lysippus their great contemporaries. We could multiply these Grecian examples;—but we now turn our attention to Roman remains.

We have inquired of the passing Roman the occasion of the erection of the castle of St. Angelo, and the destination of the Palazzo Vivaldi; and we have heard their presumed reply. Let us address the same question to the loiterer in the Piazza Colonna or the Piazza Trajana. He will immediately inform us of the dedication of the columns that adorn them; he can indeed scarcely be ignorant of it, for if unequal to reading the inscriptions, he cannot mistake the bassi relievi that wind round them. Pass on to the Forum. Inquire the name to whom the arch at the base of the capitol is inscribed;—every boy can tell you. Go forward to the arch of Titus, observe the bassi relievi that enrich it, and the history it hands down; see the small opening on its side to allow the passage of the Jews, without distressing their feelings by forcing them to pass under a monument erected to perpetuate their degradation, and enriched with sculptured representations of their defeat. Under it sits a mendicant, counting his beads and imploring charity. Inquire of him, and he will tell you its history. Ignorance indeed is impossible; for the sculpture speaks all languages. He points to it, and abject as he is, he feels with exultation that he too is a Roman; and cherishes a feeling of the honourable distinction his country once maintained among nations. Further on is the arch of Constantine;—only to elicit the same observations.

From this analysis, we may fairly draw the conclusion that there are three forms which may be depended upon to perpetuate public services by visible representations;—namely, the Obelisk, the triumphal Column, and the Arch; the latter being of a volume that will not allow it to be desecrated to other purposes. The bronze statues placed at their summits may disappear, but as the mass of sculpture and inscriptions are cut in the stone or marble, they will consecrate to a very distant day the occasion of their erection.

These considerations apply more particularly at the present time; and as we can imagine no tower too lofty, no colossus too vast to typify the great exploits of the Duke of Wellington, so it is in the wish that that fame so dear to every Englishman should be, not only *worthily* but *lastingly* commemorated, that we give our attention to it. That the latter object will not be obtained by the proposed equestrian statue, we think we have clearly proved; whether the former intention will be realized we are unwilling to discuss; but upon the *principle* of the selection of the sculptor we must be allowed to say a few words.

It cannot be denied that every artist has the fullest right to publish his ideas, and to endeavour through his friends to influence the public to carry those ideas into effect. Such was the mode by which that extraordinary man Barry originated and carried out the magnificent works that decorate the great room of the Society of Arts in the Adelphi; works unhappily too little seen, and the greater publicity of which would do much for the mental and moral improvement of the public.

Had Mr. Wyatt *originated the idea and brought forward a model*, and his friends formed a committee for the purpose of recommending *that identical design* to public notice, we cannot imagine that any one could reasonably have objected to any part of such a proceeding, nor do we suppose that under such circumstances any other party would think of appropriating the intention, or of endeavouring to supersede the original promoter of it. But in the case alluded to, no such example was followed. A public meeting was called; a noble duke, the patron of Mr. Wyatt, took the chair, surrounded by gentlemen who had been most prominent in their endeavour to place Mr. Wyatt above Sir Francis Chantrey. At that meeting no whisper escaped respecting the artist; the parties were called upon to subscribe for a memorial worthy the object of commemoration; and the subscription filled, as every subscription would fill for such a purpose. But the next meeting was decidedly of a less pure character. Assembled in the drawing room of the particular friend of Mr. Wyatt, a resolution was moved by a noble lord so unexpectedly, that no one was prepared to oppose it. If a slight attempt were made to bring forward the merit of other sculptors, it was soon smothered in the burst of approbation from one of the assembled party, who unceremoniously placed Mr. Wyatt far above Sir Francis Chantrey and Sir Richard Westmacott;—and would doubtless, *had he ever heard of such a name*, have made no exception in favour of Phidias himself. No mention was made of Baily, Lough, Carew, Campbell, Gibson, the younger Westmacott, or other sculptors;—all of whom by works of extraordinary talent and beauty, would seem to command some notice. We therefore think that the appointment has been *contrary to principle and precedent*, and the selection of the material *contrary to the conviction of experience*.

In conclusion;—fitness should govern everything: it should regulate the expenditure of the King equally with that of his lowest subject; it should determine the dimensions of the palace and the cottage; and alike distribute the embellishments of the one, and the convenience of the other. It should apportion the strength necessary for the durability of the fortress, and for the slight construction of a temporary erection. It should in all cases look to its object; and in the instance under discussion, fitness would at once dismiss metal, and

confine a monument of marble or stone to such forms and dimensions as experience has proved to be alone effective for its purpose.

J. H.

P.S. Since penning the above we have had the pleasure of seeing a statue of Earl Grey in *Portland stone*, executed for the town of Newcastle upon Tyne by E. H. Baily Esq. R. A. The artist has given it a very thin coating of wax, and from the opinion of chemical friends, is sanguine in the hope that the operation of the air and smoke will be effectually neutralized by the application.

ON THE CONSTRUCTION OF SKEW ARCHES.

Fig. 1.

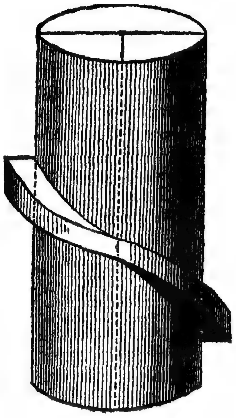


Fig. 3.

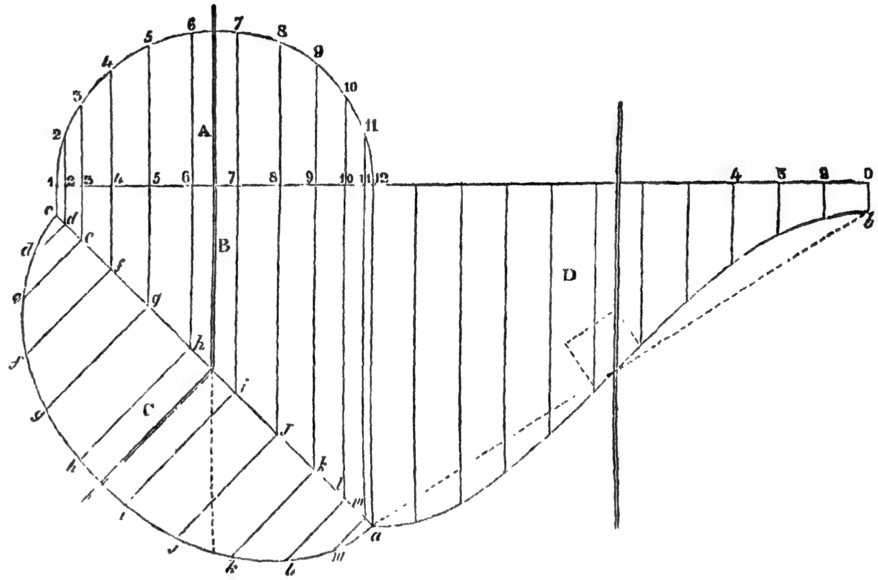


Fig. 2

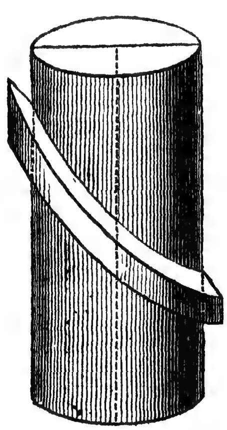


Fig. 4.

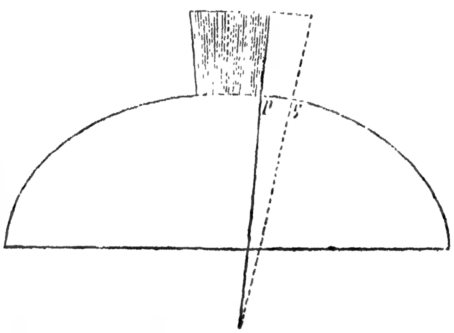


Fig. 5.

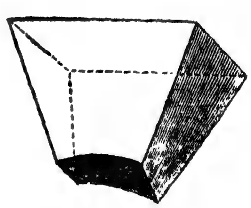
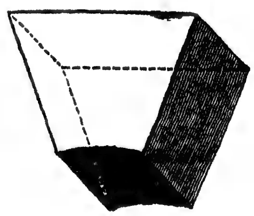


Fig. 6.



Although the construction of skew arches has of late engaged the attention of many practical men, and various essays have been written upon the subject, yet I am not aware that any of these have been sufficiently simple to enable the workman to set out a skew arch without considerable difficulty. One of the leading articles upon this subject was written by Mr. C. Fox, and read before the Institute of British Architects more than two years since. It was subsequently published in the Philosophical Magazine for April 1836; and afterwards in the Architectural Magazine for the following June, where it was mentioned in terms of considerable approbation. As this essay contained many erroneous ideas, which tended rather to confuse than to simplify the subject, it is perhaps a matter of some surprise that its contents have not been answered before. But I am not aware that any attempt has been made in any philosophical journal to point out its errors; on the contrary as far as I have been able to ascertain, the same ideas have been imbibed by many subsequent writers.

In the present article I shall endeavour to point out the leading error in the essay referred to, and likewise attempt to render the subject of sufficient simplicity to suit the most ordinary capacity.

Mr. Fox states in the first place, that a skew arch is really a square threaded screw wound round a cylinder; and with this position in view he proceeds to explain the mode of constructing the arch;—all of which is unfortunately wrong, as a skew arch is *not a square threaded screw;* and indeed it bears but little analogy to it.

The traverse of a square headed screw, is formed by a straight line wound round a cylinder, every part of which line cuts the axis of the cylinder at the same angle; and when thus wound round the cylinder it presents to the eye the appearance of a spiral and not of a straight line. A skew arch on the contrary is formed by a *spiral* line wound a cylinder, every part of which cuts the axis of the cylinder at a *different* angle,—the angle being greatest at the key stone, and least at the springings; and when thus wound round the cylinder it presents to the eye the appearance of a *straight* line. If a cylinder be cut in the direction of the thread of a screw, the section will be an ellipse, but the surface of the section will be waved and not level. If a cylinder be cut in the direction of a skew arch, the section will be an ellipse, and the surface of the section will be quite level. In a square threaded screw, the side of the thread forms what would be termed the face of the arch, and is always at right angles to the axis of the cylinder; and the angle which the thread itself forms with the axis is continually changing as the parts of the thread become more remote from the centre. But in a skew arch, the key stone alone of the face of the arch is at right angles with the axis of the cylinder, every part of the face of the arch forms exactly the same angle with the axis *when viewed from above the arch*, and the springing stones of the arch will be found on one side to present an obtuse and on the other an acute angle to the axis.

This description will be rendered more simple by a comparison of the diagrams figs. 1 and 2. Fig. 1 represents the thread of a square threaded screw wound half way round the cylinder, and fig. 2 a skew

arch likewise carried half way round the cylinder; the difference between these two will be readily perceived.

From this statement it will be apparent, that the intermediate development of which Mr. Fox speaks, is quite unnecessary; as every part of the thickness of the arch crosses the axis of the cylinder at the same angle, the approximate line (that is a line joining the two extreme points of the spiral line as *a b*, fig. 3) is always at the same angle, whether taken at the top, the middle, or the soffit of the arch.

In endeavouring to explain the method of ascertaining one of the most important parts of a skew arch, viz. the twist of the beds, Mr. Fox has likewise introduced a problem which, however simple it may appear to himself, is not certainly very intelligible to a working mason; at least the same result may be obtained by means much more certain and less complicated. In support of this statement I shall merely endeavour to show the most simple method of constructing a skew bridge.

The diagrams figs. 3 and 4 represent all that is necessary for this purpose; the angle here chosen is 45 deg., but the same rule will apply to any angle whatever. Let A fig. 3 represent the section of a skew arch, cut at right angles with the abutments; and B the plan of the same, the angle being 45 deg. Divide the circumference of the circle A into as many equal parts as there are intended to be stones in the arch; and from these points draw the lines 1, 2, 3, 4, &c. parallel to the sides of the arch; at the points where they intersect the line *a c*, which is the face of the skew bridge, draw the lines *d*, *e*, *f*, *g*, &c. at right angles to the line *a c*. Then take the length of the lines 2, 2; 3, 3; 4, 4, &c. and apply them to the lines *d*, *e*, *f*, *g*, &c.;—then draw the curve *c d e*, &c., through all these points, and the figure C will be the part of a skew arch constructed upon the semi-cylinder A at an angle of forty-five degrees. D represents the form of the soffit of the arch, and is equally simple in its construction. The line 12,0 is equal in length to the circumference of the semi-cylinder A, and divided into the same number of parts by lines drawn at right angles thereto. If the length of the lines 1, *c*; 2, *d*; 3, *e*; &c. be set off on the corresponding lines 2, 3, 4, &c., then a line drawn through all the lowermost points will form the spiral line *a b*; and the figure D if bent into the form of a semicircle, will form the soffit of a skew arch cut to the angle of 45 degrees. The dotted straight line *a b*, which connects the two extreme points of the spiral line is the nearest approximate to it that can be obtained by a straight line; and all the soffits of the stones should be drawn at right angles to this dotted line, by which means the thrust of the arch will be exerted in the true direction.

Having thus obtained the forms of the soffits, the next thing to be considered is the twist of the beds. In the skew arch, the beds of the stones are not parallel throughout, as is the case with a square arch. As every stone crosses the axis of the bridge at a certain angle, one part of the stone must necessarily be higher up on the arch than the other; and as every part of the bed must point to the axis of the bridge, the beds will, when properly worked, exhibit an appearance similar to a board which has twisted or warped, the twist being greater or less in proportion to the obliquity of the arch. This angle is easily obtained as follows. Let fig. 4 represent the front of a skew arch; the front of the key stone, the dotted soffit of which is shown at D fig. 3, is here indicated by the shaded surface; and the back of the same stone is shown by the dotted outline beside it. The distance from *p* to *q*, fig. 4 is the difference between the distance of the front and back of the stone from the centre or highest part of the arch. If two lines be drawn through these points, as nearly as possible at right angles to the curvature of the arch, the angle formed by their intersection will be the actual wind of the stones.

Figs. 5 and 6 are merely introduced to give to the workman some idea of the difference between the stones of the skew and a straight arch; fig. 5 being the stone of a skew arch, and fig. 6 of a straight one.

In order to understand this subject accurately the following considerations ought never to be lost sight of. First:—the actual thrust of a skew arch is in the direction of the spiral line, and the beds of the stones ought always to be at right angles to this line as nearly as possible; as however the approximate line joins the two ends of the spiral line, and cuts it in the middle, if the stones are placed at right angles to this line, it will be quite sufficient for all practical purposes: as any obliquity in the thrust on one side is counterbalanced by a corresponding obliquity of the other side in an opposite direction. Second:—the face of a skew arch whose centering is part of a cylinder, will always be part of an ellipse, and the fronts of the stones must therefore be drawn to a right angle with the curvature of the arch, as in any other elliptical arch, and not to one centre as in a circular arch. Third:—the beds of all the stones ought always to point to the axis of the arch; which axis will be the centre of the circle of which the surface of the centering is the circumference. C. L. O.

(To be continued.)

HISTORY OF SUSPENSION BRIDGES.

In reading some time ago a book in my possession entitled "*Papirii Massoni descriptio Fluminum Galliæ, quæ Francia est.*" *Parisiis* 1678, I found amidst a considerable mass of topographical information which to the engineer is always interesting, a notice of three hanging bridges over the river Charente. From the earliness of the date and the likelihood of the bridges having been made some ten or twenty years before the book was printed, I am inclined to believe that the suspension principle had been *commonly* adopted on the continent of Europe at an earlier period than is perhaps generally supposed. Drewry indeed, on the authority of *Davila*, states that Charles IX. employed bridges of cordage at the siege of Poictiers, towards the close of the 16th century. But as Papirius Masson does no more than mention *en passant*, that such bridges existed on the Charente, without giving any of the details of their construction, or saying anything to lead the reader to suppose that they were at all uncommon in his days, we must infer that the "*pontes pensiles*" as he styles them, were then usually resorted to in crossing deep ravines and such other places where stone or wooden bridges could not easily be erected.

In many parts of the book, tolerably minute accounts are given of wooden and stone bridges; but of the hanging bridges no details whatever are given. That they were not made on a large scale, seems probable from the description given in the following quotation of the places where they were erected. "*Tres enim pontes pensiles ibi sunt; unus quo itur in hortos, alter in pratum ingens, tertius in sylvam partim cæduam, partim non; quæ loca circuitu aquarum ejus fluminis junguntur.*" These Bridges were on the "*Carantonus*" (which is the modern Charente), between Jarnac and Cognac, towns situated on its banks, and what is curious, within 65 miles of the town of Poictiers, the spot where they were first used in Europe. There is also an account of Charles IX. having fought a battle at Jarnac. That *pensilis* refers solely to suspension bridges, is evident from the author's having in no other instance spoken of a bridge without distinguishing it by the title *lapideus* or *ligneus*.

* —— *

FUEL FROM COMPRESSED PEAT.

We last autumn called the attention of the public to this, which we then considered and described as an invention of great national importance, by Lord Willoughby de Eresby. At that time we were perfectly satisfied with the experiments we saw tried, and felt convinced that, whenever this simple operation came to be applied in the wilder districts of Scotland and Ireland, it would be found to be a most powerful means of improvement and civilisation. Since then, the noble lord has been sedulously occupied with the improvement of the machine; and a perfected instrument was lately exhibited at work in the manufactory of Mr. Napier, the engineer, York-road, Westminster-bridge. A number of noblemen and scientific and foreign gentlemen, interested in the success of such a discovery, were present on the occasion; among whom were Lord Cadogan, Lord Clare, Lord Glengall, Lord Boringdon, Mr. Macdonell (Antrim), Mr. Cornwall, &c. In their presence the common moist and wet peat was put into the chamber, and compressed by a lever (longer than that formerly employed, and consequently more powerful), the water running abundantly through the channels of the machine. The specimen was then taken out and shown to be reduced in size, and confirmed in solidity. Lord Willoughby proposes not to apply a second pressure immediately, but to go on with single actions, and leave the peats for some twenty-four hours, to acquire greater consistency and to dry. The internal wet will, in this time, be brought to the surface; and then, when the material is submitted to the second and final operation of the machine, it will become more hard and free from moisture than if both processes had been employed closely together. Of this, convincing evidence was afforded in peats which had been pressed two days previously, and were perfectly dry, heavy, and consistent; and some that had been preserved since last year were scarcely to be distinguished from coal. Every person present expressed great gratification at seeing the principle of this invention so satisfactorily demonstrated, and its practice shown to be so easy and certain. Nor can we wonder at this, when we consider what effects it is calculated to produce. Here is a fuel superior to coal, for the manufacture of the finest cutlery;—probably from being without sulphur. Here is a fuel calculated to produce superior comfort in every cottage, hut, cabin, and shieling throughout a very large portion of the British empire. Here is a fuel that can always be obtained by the lowly population of these districts, with infinitely less cost of labour and time than the mere cutting and drying of turf or peat. Here is a fuel which, used in lime-burning, may carry the blessings of agriculture into places hitherto utterly barren and incapable of cultivation; and a fuel which, by its application to fires and furnaces, working machinery, or raising of steam, may convert desert tracts into hives of manufacturing industry. Feeling and foreseeing these things, we think it impossible to over-estimate the benefits that are likely to accrue from this mighty, though simple invention. It will now be practically tried in many lands, both in Scotland and Ireland; and, like all other great improvements, when once planted, and its advantages witnessed, the example will soon spread, and we shall see the face of the country changed by this one most obvious and efficacious operation.—*Literary Gazette.*

Roman Road.—In pursuing the excavation in High Street, Lincoln, for the purpose of laying a tunnel from the Butchery to the river, the workmen lately bared a portion of the old Roman road. It is nearly a yard below the present surface of the street, and great difficulty was experienced in breaking through it. It seems to be a composition of lime, ashes, and stone, and is congealed into one solid mass, about a foot in thickness, and as hard as iron.—*Boston Herald.*

REPORT ON THE ERECTION OF A SAFETY FISHING HARBOUR
IN TRAMORE BAY, COUNTY OF WATERFORD,

By William Bald, F.R.S.E. M.R.I.A. &c. Civil Engineer.

The Lady cove, where the safety harbour is proposed to be erected, is situated on the Western side of Tramore bay, about five furlongs S.W. by S. of the town of Tramore, which lies close on the edge of the N.N.W. corner of the bay. (C, in map No. X. p. 256.)

The Bay of Tramore has been one of the most destructive to man, and also to ships, of all bays on the shores of the British empire; scarcely a winter passes but ships are wrecked and lives lost,—sometimes so many as five ships have been wrecked in one month. The waste of life and property within this dangerous and terrible bay, is such as to exceed that in any other to be found on any part of the shores of the British isles. History can no where hardly record a more melancholy event than that of the shipwreck of the Sea Horse transport, on the 13th January 1816 in the Bay of Tramore, and within one mile of the shore. She was bound to India, and had on board a part of the second battalion of the 59th regiment; of which perished 264 non-commissioned officers and privates, also Lieutenant Allen R.N., 15 sailors, 71 women and children. Only four officers and 26 soldiers and seamen survived this awful catastrophe, out of a crew composed of seamen and passengers amounting to 362 souls.

The commercial and shipping interests of the United Kingdom, call imperatively on the executive of the country, that this bay which has entombed so many valuable men, and property to the amount of hundreds of thousands of pounds sterling, should be deprived of its power of destruction by the erection of an Asylum, or Safety Harbour. The position of Tramore Bay, on the Southern coast of Ireland, by which so many ships pass and repass continually from the sea-ports on the West of Great Britain, bound to North and South America, and the East and West Indies &c. &c. further points it out as a most eligible place for a Safety Harbour. It has frequently been mistaken by mariners for the entrance to the Harbour of Waterford; and such is the power of the indraught and run of the sea into Tramore Bay, that ships falling within its headlands have seldom been known to get out.

It now becomes necessary to describe the Bay of Tramore, so remarkable for the destruction of lives and property.

The Bay of Tramore is about 2½ miles long by 2 miles broad; but behind the front strand of this bay lies a large plain of sand and mud, called the back strand, 2 miles long by 1¼ mile wide, and entirely covered at high water. The tide of flood flows through the strait near the ferry of Rhineshark with a rapid current, and fills the interior bay, producing an indraught into the outer Bay of Tramore destructive to the mariner who has the misfortune to enter it. The breadth of the strait near the ferry of Rhineshark, is at high water about 280 yards, and at low water tide about 90 yards. The front strand of Tramore Bay consists of a sandy beach of 2¼ miles in length; the rabbit warren or Burrow, situated on the Eastern portion of the strand, consists of elevated sand hills extending along the coast for 1¼ mile. The Western part of the front strand is low and covered with shingle and sand. The Western side of Tramore Bay, taken from the town of Tramore to Newton Head, bears S.W. by W. ¼ W., is in length 2 miles and 2 furlongs, and consists of an iron bound shore from forty to eighty feet in height, formed of compact indurated masses of grey Wackie rock, in beds nearly vertical, and running parallel with the coast. On this side of Tramore Bay is situated the Lady cove, which is about five furlongs from the town of Tramore. On this side of the bay also, is situated Ough a Iskey, or the fishing cove, and also Newton cove, lying close to it, which are distant from the town of Tramore about 1½ mile. These coves are creeks formed out of the steep cliffs by the action of the sea; none of them in gales of wind afford any shelter to boats. There are three boats belonging to Newton cove, and 12 boats to Lady cove; all these small craft require to be drawn up on the land beyond the reach of the sea. Such is the very unprotected state of the best sheltered creeks to be found on any part of the shores of Tramore Bay, except the inner pool of Rhineshark.

The Eastern side or shore of Tramore Bay is two miles long, reckoning from the strait or ferry at Rhineshark Pool, to Brownstown Head; and the general bearing is S.W. by S. At low water this shore, along the Rhineshark entrance within the bar, consists of sand; it extends in length 1 mile 2 furlongs, and from the bar of Rhineshark to Brownstown Head about ¾ of a mile; and consists of a rocky exposed coast.

The Harbour of Rhineshark has been formed and maintained by the scouring power of the water of the Back Strand. Within the strait near the ferry is a pool of from 2½ to 4 fathoms deep at low water, which is sheltered by the Burrow strand from the prevailing gales and the run of the sea; this is properly called Rhineshark Harbour. There are five hookers and 24 small boats belonging to this harbour and the upper inlets; these hookers are about 12 tons each, and are employed in fishing; the 24 small boats are rated at 3 tons each, and are principally employed in carrying in manure and sand from the outer bar to the interior. This harbour is bar-mouthed, and on the bar at low water there is not more than from 3 to 4 feet depth of water. The entrance channel is narrow and difficult to navigate, except by pilots well acquainted with it; there being neither beacons nor buoys to mark the channel where it is navigable. The prevailing South Westerly winds blow directly into the entrance of the harbour, causing a dangerous run of sea, and making it extremely difficult to either small vessels or fishing craft of any kind to get out.

The Bay of Tramore, in extent may be taken at five square miles, and is completely open and exposed to all gales of wind blowing from South East to South West. The depths of water in this Bay commencing at its entrance are 10, 8, 6¾, 4, 3, and 1½ fathoms within half a mile of high water mark on the front strand. The Pollock rock lies within a half mile of the head of the bay, and Eastward of the middle of that part of the bay about half a mile. The bottom of Tramore Bay is in parts foul and rocky, so that cables are frequently cut, and ships lost. On Brownstown Head there are two towers; and on Newton Head there are three towers. These towers are 60 feet high each, and are white-washed, so that they can be seen in clear weather at a considerable distance seaward, to warn mariners of their approach to this dangerous bay. The captain of the Grecian merchantman from the West Indies, bound to Liverpool, declared that he mistook Tramore Bay with the the towers on its head-lands for the entrance to Waterford Harbour; his ship consequently was carried in by the pilots to Rhineshark, from which harbour she was obliged to be towed out by a steamer, and taken round to Waterford. The front strand of Tramore Bay, at the Western end is much less covered with sand than at the Eastern, and the sand appears to be accumulating on the Eastern side. The cause of this in my opinion is, that the run of the sea is much heavier from the Westward than from the Eastward; this added to the strong tide current setting into the back strand through the Rhineshark strait, carries all the loose moving sand towards the Eastern side of the bay.

It appeared upon a careful examination of the West side of Tramore Bay, between Newtown Head, and the town of Tramore, that the Lady cove is the most eligible place to erect a small safety fishing harbour. The Lady cove can be more safely approached and landed at by boats when the ground swell sets in, than either the fishing cove or Newtown cove. But it is to be observed that when the swell is great, it is impossible to land on any part of this coast; and it is generally both dangerous and difficult to do so, when there is anything like a run of high sea, because there are no works of defence erected upon any part of this shore to afford shelter or protection to boats to land during stormy weather, nor is there an artificial harbour of any kind, on any part of Tramore Bay, comprehending an extent of 14 miles of coast. The Lady cove, is a small open bay, surrounded by rocky cliffs and steep grassy banks. At low water it presents an area of 300 feet in width by 250 feet in depth, bounded at high water line by a beach of shingle and stone; and the remainder of the surface is covered with the rock down to low water mark. In the centre, the fishermen have cleared away a space of rock of 150 feet in length, by 24 feet in breadth, extending from high to low water line, for their accommodation in landing the boats; which for safety they are obliged to draw up above high water mark upon a road ending at the head of this little bay. Along the South side of the road runs a small stream which falls into the sea, within the proposed harbour.

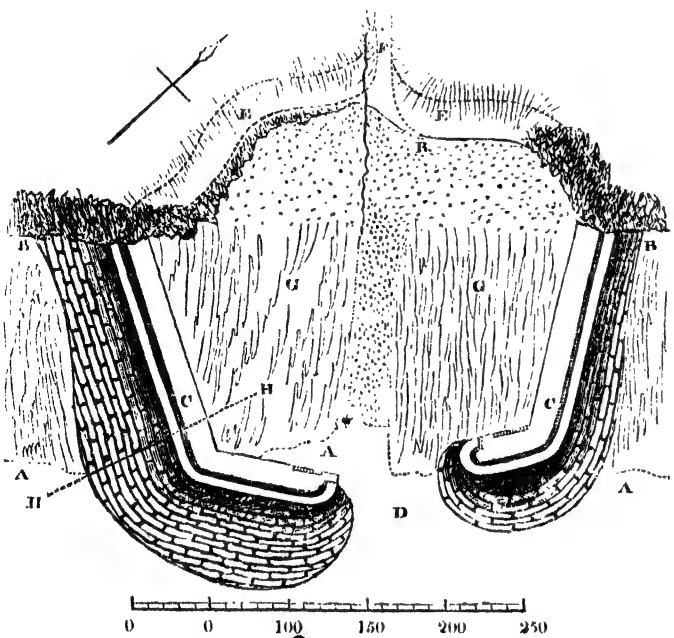
At low water the Lady cove presents an uncovered rocky beach for a breadth of from 140 to 200 feet, on which the sea has full room to expand itself, without rebounding back and producing those dangerous swells in gales, which are always found to take place when the coast line of the water is terminated by a perpendicular cliff. Boats have therefore landed at low tide at the Lady cove, during heavy and dangerous ground swells, when they have found it impossible to do so, at either the fishing cove, or Newtown cove; because those coves are narrow and bounded by high rocky cliffs against which the action of the waves produces those high and broken seas which swamp and overwhelm boats or small craft in attempting to land at them.

I propose to construct a Pier on the South West side of the Lady cove, as described drawn and delineated in the drawings which accompany this report. The pier (see Fig. 1) is to run out for a length of one hundred and forty feet S.E. by E. ¾ East, then in a direction N.E. 85 feet, where it will terminate a little beyond ordinary low water mark. This pier will protect the space inside intended for the harbour; because by examination of the small chart, it will be seen that the Lady cove is open only to gales blowing between S.S.E. ¼ East, and S.W. by S. ¾ West; the first is the bearing from the Lady cove to Brownstown Head, and the latter the general bearing of the coast lying to windward of it. The breakwater is to be at its base 90 feet broad; with quay walls inside, rising 8 feet above high water spring tides. Seaward it is to be armed with a heavy pavement, set in a concave curved parabolic form, commencing at high water line, and extending to the top of the storm parapet; then from high water line to low water line, the sea-pavement is to be of a convex elliptic form as drawn and described in the transverse section delineated in Fig. 2. The parapet is to be six feet high, and six feet thick; and its windward side will form the upper terminating curved portion of the breakwater glacis, on which the run of the high sea will fall and play in stormy weather, blowing from between S.S.E. ¼ East, and S.W. by S. ¾ West, being about 5¾ points of the compass, to which it will be exposed to the force and run of the ocean, during storms and gales of wind. I am quite aware of the heavy and high run of the sea into this bay, and its destructive power; but I am also equally certain and convinced that it is practicable to construct a permanent pier here, that shall be able to resist the sea, and form an excellent small Safety Harbour.

The sectional form I have given to the proposed breakwater, nearly resembles the shape which the celebrated Cherbourg Breakwater in France *took* after being many years exposed to the full and unlimited momentum of the ocean, and encountering during that period repeated gales and severe storms. This is the form which nature in deep water will assign to such masses of heavy matter exposed to the roll of the sea; it is therefore the best shape to be adopted where marine works are to be constructed, which will have to resist during high gales and storms, the whole force of the open ocean.

It is proposed to cut out the whole of the rocky floor of this intended harbour, which lies between the pier, and the small boat channel cleared out by the fishermen; the rock taken out is to be packed into the interior filling of the breakwater; and the remainder of the filling may be taken from along the cliff which extends from the root of the proposed pier to the end of the present road terminating at the head of the bay. If the excavation be judiciously executed, and kept above high water line, a good roadway 12 to 15 feet wide may be made along this part, connecting the proposed pier with the present existing old road leading to the town of Tramore, which contains a population of 1,600 souls and is rapidly increasing. To connect the town of Tramore with the new proposed harbour by a new level line of road, would be a most useful and desirable work, the old road being extremely hilly and very much elevated. The distance from the proposed harbour to the town of Tramore along the cliff is about six furlongs, and the proposed road would form one of the most beautiful and interesting road works yet executed in Ireland; while its great usefulness would extend to all classes of society, by its being perfectly level, and affording an easy draught to the drawing of loads of all kinds coming from and going to the harbour. This road would be useful in opening up many improvements connected with the rising town of Tramore, the Brighton of the South of Ireland.

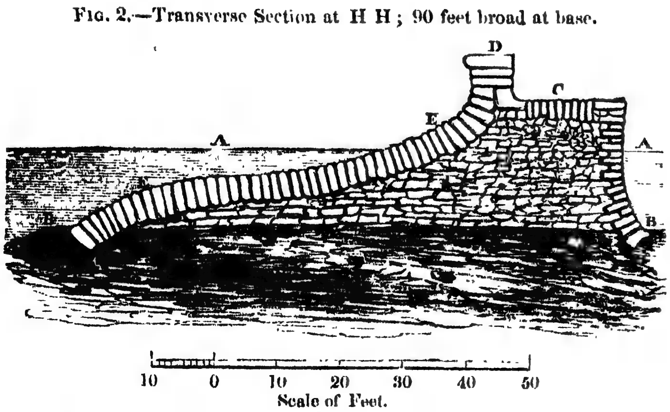
Fig. 1.—Plan of Harbour.



References.

A A A, Low-water spring tides.—B B B, High-water spring-tides.—C, C, Piers.—D, Tramore Bay.—E E, Proposed road way.—F, Present road.—G G, Harbour.—H H Line of transverse section.

Fig. 2.—Transverse Section at H H; 90 feet broad at base.



References.

A A, High-water spring-tides.—B B, Low-water spring-tides.—C, Top of quay, 18 feet wide.—D, Parapet at top of storm pavement.—E E, Breakwater glacis, or storm pavement.

I have in Fig. 1 delineated a second arm or pier to the proposed safety harbour; but as the execution of this part would when combined with that of the seaward pier, amount to a sum which could not perhaps be reasonably expected to be procured at present, I have refrained from putting the amount of its expense into the estimate; and more particularly because the experience of protection arising from the construction of the pier now recommended, will become more fully known, and the further extension will proceed upon a more extended knowledge of the subject in all its details than can at present possibly exist.

During my second examination of the Lady cove, I had the kind assistance of Lieutenant Scuddamore of the Waterguard service, who resides there, and who is thoroughly acquainted with the place in all its maritime details and capabilities; and as far as I consulted him, he coincided in opinion with me, regarding the eligibility of Lady cove, as being the best place for the erection of a small safety harbour, the practicability of its execution, and also the very great benefit that would be derived from it as a harbour for the extension of the fisheries on this portion of the coast of Ireland, so extremely productive of all kinds of fish. Within the pier at ordinary high-water spring tides, there would be a depth of eleven feet of water.*

In the event of a pier being constructed at Lady cove, I do not apprehend that there will be any silting up; because the whole beach, to seaward and windward, consists of a clean rocky shore. There is also a stream of water continually running through the harbour, and which is considerable in winter, offering a scouring power of some magnitude under proper management, if such should at any time be required.

There can be no doubt that the erection of a pier, for the protection of fishing boats at the Lady cove, would extend the fisheries very much on this part of the coast of Ireland; because as there would be safety and protection, boats of a larger size would then be procured. There lies immediately off Tramore Bay, the best fishing ground on the South coast, where at present when the weather permits, boats from Waterford and Dungarvin are constantly fishing. The Nymph Bank, which lies off this part of the coast, would open an inexhaustible mine of wealth to the fishermen of Tramore, who would be enabled to supply Waterford, and all the interior towns with an abundance of fish. I am so thoroughly convinced of the success which would attend the construction of this little safety harbour, that in place of 12 small boats (the number at present belonging to the Lady cove) I am confident there would be hundreds; and I have no doubt there would be in a short period not less than 400 persons employed in fishing, instead of 48 the present number. I am further convinced, that this little harbour would give birth to a considerable import and export trade, which does not at present exist; by which the trade and traffic of the country would be much increased.

In concluding, I cannot but express my regret that it has not fallen to my lot, to advocate the erection of a larger harbour on this coast, than the small one which I have now reported on. The disasters on this coast have been so numerous, and so frightful, that I am impressed with the necessity of the erection of an Asylum Harbour of magnitude in deep water, near the entrance on the West side of Tramore Bay; and the national necessity for such a work has induced me to quote a paragraph from a report of mine on the erection of an Asylum Harbour at the Skerries, on the East coast of Ireland, which is however much more applicable to the Bay of Tramore, than to any other part of the coast of Ireland.

"The erection and formation of these maritime works for the preservation of life and property, would be alike creditable to the wisdom and humanity of the rulers of the British Isles." But if this be doomed to no further regard, then I may fairly quote the following paragraph. "That the subject with which they have to deal is that of human life; of the lives too of the industrious mariner whom they have severely taxed, and of the helpless seafaring stranger whom they have taxed without mercy. If they fail in this sacred duty, they will be answerable to a tribunal more solemn than that of their constituency, a tribunal where benevolence will be their judge, science their accuser, and the widows and orphans their jury."

I remain Gentlemen,

Your most obedient Servant,

WILLIAM BALD.

To Patrick William Power, Esq., and
George Lewis Smyth, Esq.

Estimate to build a safety Harbour at the Lady cove, Tramore Bay, County of Waterford.

	£	s.	d.
3333 cubic yards of rock to be excavated out of the harbour and packed into the breakwater, at 3s. 6d. per cubic yard	583	5	6
3333 cubic yards of rock to be filled into the pier and breakwater, at 2s. 6d.	416	12	6
666 cubic yards of masonry in quay wall, at 12s. per cubic yard	399	12	0
1894 cubic yards of masonry in covering and arming the breakwater, at 12s. per cubic yard	1136	8	0
333 cubic yards of masonry in storm parapet, at 12s. per cubic yard	199	16	0
375 superficial yards of paving on top of quay, at 3s. per yard	56	5	0
Stair and mooring posts	22	12	0
	£2814	11	0
Contingencies 15 per cent.	422	0	0
	£3236	11	6

• (*Signed*) WILLIAM BALD, *Civil Engineer.*

Dublin, September, 1837.

rise about twelve feet; neap tides about seven feet six inches.

VICTORIA HULL STEAM SHIP.

Fig. 1.—Longitudinal Section of Wing Boiler, exhibiting the ruptures.

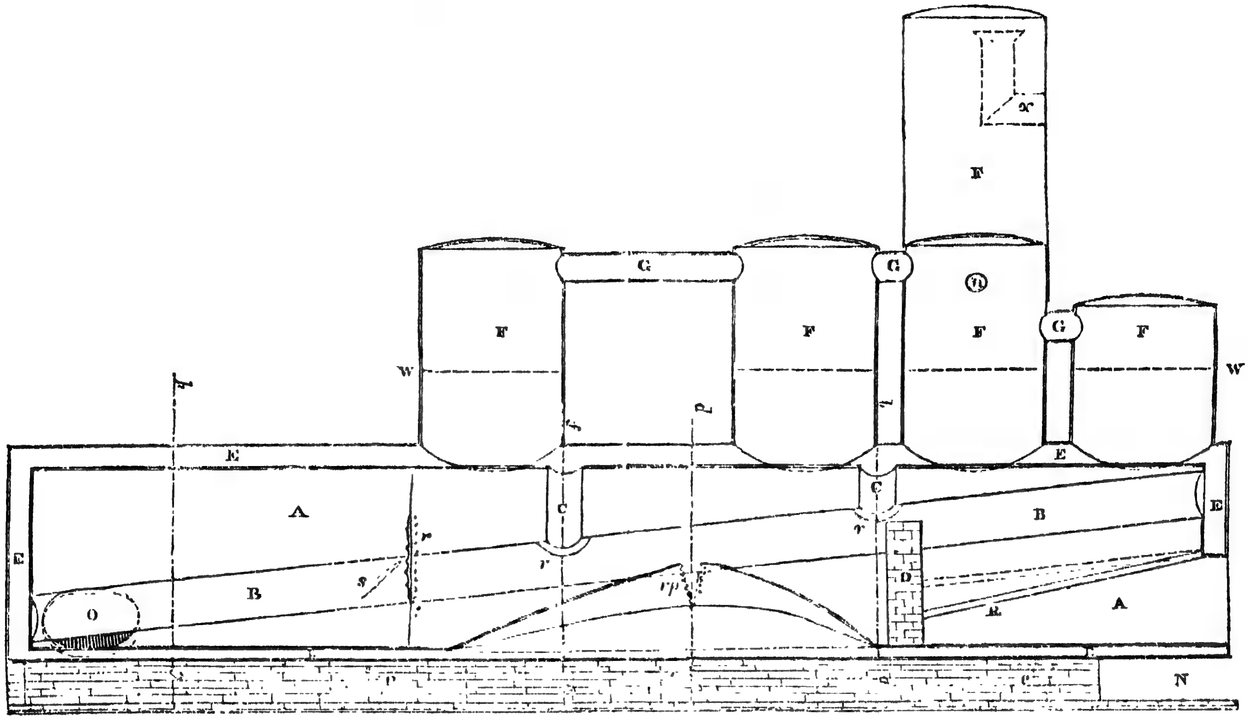
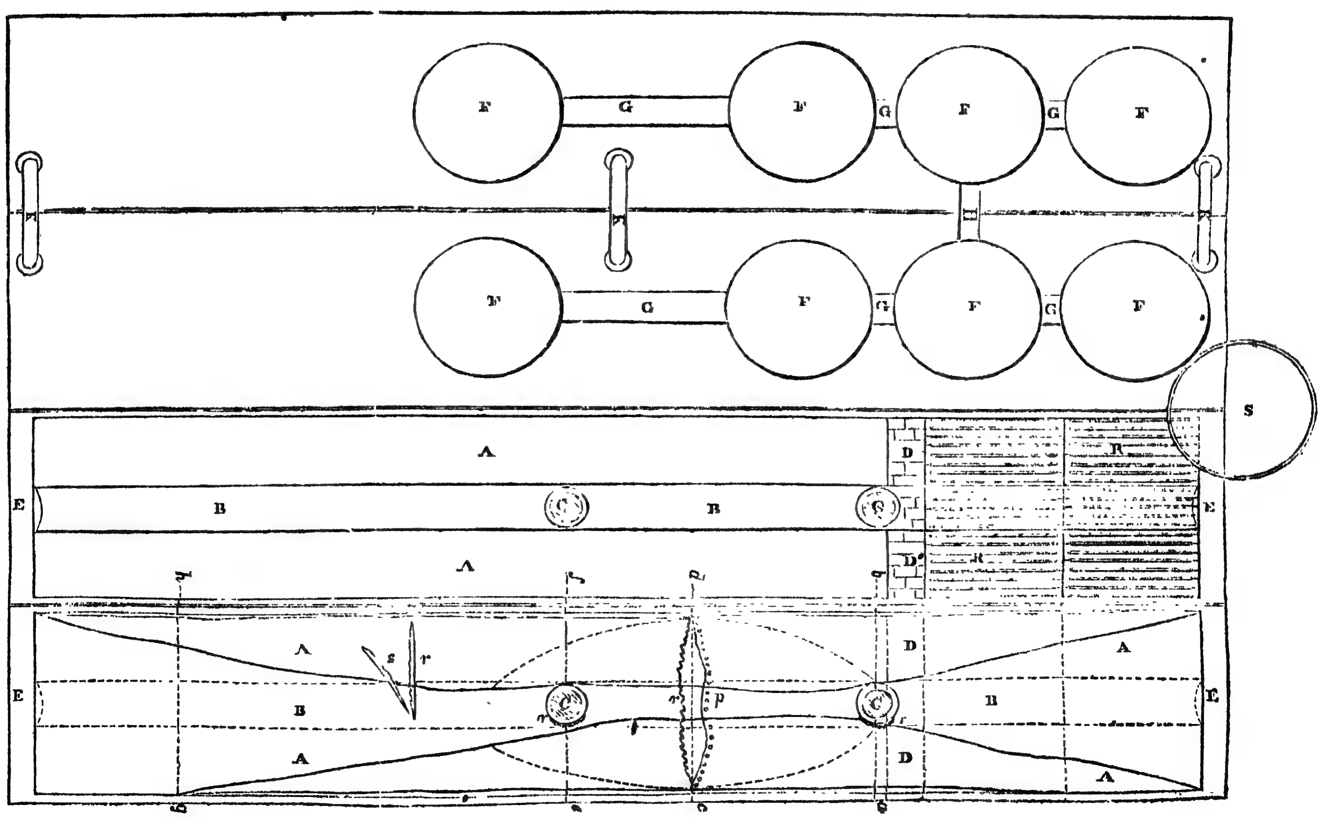


Fig. 2.—Plan; showing the exterior of two adjoining Boilers;—the interior of the third, the upper half being removed;—the fire flue of the fourth (the collapsed one), the upper half of the outer case being removed.



Scale of Feet to Figs. 1, 2, & 3.

1 0 5 10 15 20 25

THE VICTORIA STEAM SHIP.

CORONER'S INQUEST.—EXPLOSION ON BOARD THE VICTORIA HULL STEAM SHIP.—OPINION OF THE GOVERNMENT ENGINEER.

Considering this inquest to be one of great importance, we attended the last investigation to watch the proceedings for the purpose of laying them before our readers; and for the better understanding of the evidence, we have given copies of the drawings produced by Mr. Ewart in his evidence, which we are enabled to do by his permission and that of the coroner. We abstain from giving the evidence of the four first days' investigation, as the whole would more than fill our Journal; those who feel deeply interested in the matter, we recommend to peruse the prior days' evidence, which will be found in most of the daily papers, and by the assistance of the drawings given in our Journal the investigation will be properly understood.

General References to the Drawings.

A—Principal flue, or fire tube.
B—Water tube.
C—Rising pipes of do.
D—Brick bridges of the furnaces.
E—Water space around the fire tube.
F—Steam chambers.
G—Fore and aft steam connecting-pipes.
H—Athwart ship do. do.
K—Water connecting-pipes; uniting each wing boiler with the adjoining midship boiler.
L—Feed-pipe.
M—Feed-cocks.
N—Outer flues, formed of bricks resting on iron plates.
O—Vent from fire tube to flues N.
P—Boiler seating of brick.
R—Furnace bars; in fig. 1, the dotted lines show the bars of the midship furnaces.
S—Chimney.
T—Man holes to water tubes.
W—Water line.
x—Steam pipes; they are so connected that the steam has free communication with all the four boilers.
r—Rupture; *rp*, Principal rupture; *s*, Detached piece; in drawing all which, it must be observed, we have for distinctness employed full lines, even where dotted ones should properly be used to denote that another surface intervenes.

On Wednesday morning, July 18th, at eleven o'clock, the inquest on the bodies of the nine unfortunate men who were killed on board the steam-ship Victoria, trading between London and Hull, by the bursting of one of her boilers, was resumed before Mr. Baker, coroner, and a jury, at the Waterman's Arms Tavern, Shadwell Dock-stairs. The investigation had already occupied four days.

Mr. L. Jacobs, the solicitor to the Hull Steam-packet Company, and Mr. W. J. Hall, the agent and managing owner, attended to watch the interests of that body.

The Coroner read over the names of the Jury, and the correspondence which had passed between him and the Home Secretary, for the appointment of a government engineer to inspect the boilers; which led to the appointment of Mr. Ewart, Engineer at her Majesty's Dockyard Woolwich.

Mr. Peter Ewart deposed that he was chief engineer and inspector of machinery, to the Admiralty. He had been so about three years, but had been intimately acquainted with the business generally for 48 years, and took the general management of the mail-packets. He examines the boilers. He often works from the designs of others, but he has been a theoretical and practical man all his life.

The Coroner asked Mr. Ewart if he had prepared any report, or intended to give his evidence *viva voce?*

Mr. Ewart said he was ready to answer any questions that might be put to him

Mr. Ewart's evidence was then taken. In pursuance of the instructions he had received from the Home office, he had made four separate examinations of the boilers. At the first visit to the vessel, he went into the stoke hole, where he received every attention from Captain Bell, who explained everything to him. He found the boilers of the Victoria so constructed that the pressure might be varied from 3lb. on the square inch, to 13½lb. The *maximum* of low pressure was 5lb., and commonly only 3lb. The boilers in the Queen's service are square, not circular. The pressure on the square inch, with the boilers used in the Queen's service, never exceeded 5lb.; the average was about 4lb., but the orders were, never to exceed 5lb. With the same strength of metal the circular boilers are stronger than the square ones if the circular are not too large.

The Coroner—Do you consider the high pressure as safe as the low pressure?

Witness—It is too general a question.

The Coroner and Jury then asked the witness several questions, but he said he could not answer such general questions.

The Foreman said, the Jury had not sufficient experience in steam-engineering to ask proper questions. It would be better if the gentleman would give his evidence by way of report.

Mr. Ewart said, he would endeavour to answer the Coroner's questions as to the relative safety of high and low pressure engines. There was a greater number of more serious accidents with high pressure engines, than with low pressure. The high pressure engines had been used in Cornwall for many years, and latterly with very little accident. He produced a drawing, but said he was not going to give a lecture; it was almost impossible to do so here. According to the construction of boilers now adopted, very few accidents had occurred. The boilers of the Victoria were nearly of an oval shape, about 6 feet 5 inches in diameter; the water spaces vary from 2½ inches at the sides, to 3 at bottom, and 6 at top. There was 9 feet of water pressing on the bottom of the boilers, making by its weight a total pressure of 17lb. on the bottom of the boilers. The water spaces of the Cornish boilers round the flues were much larger, being at least 6 inches at the bottom and 21 inches at top (*vide* fig. 9). The external cylinder of the boilers was about 6 feet in diameter, and the internal 3 feet 9 inches, leaving a water space of 6 inches at the bottom; and instead of being filled with water, a space was left in the upper part of the boilers occupied by steam. The plates were generally half an inch in thickness, and the safety-valves were generally loaded with 45lb. on the square inch. These constitute the chief differences between the Cornish boilers and those of the Victoria. He attributed the superior safety of the Cornish boilers to the difference in their construction altogether. He wished to observe that almost all the towing vessels on the river Thames have high pressure boilers, made very much upon the Cornish principle, and very few accidents have occurred to them of late years; further, he considered the water spaces of the Victoria's boilers much too small, and their plates of insufficient thickness. He found them from a quarter of an inch to very near three-eighths in thickness only. He produced a section of the boiler that burst. In the longitudinal section (fig. 1) the lower part of the fire tube had been originally straight, but was now bent upwards two feet, and torn asunder. The thickness of the plates at this part was little more than a quarter of an inch, but about 6 feet further aft, and where the iron had yielded very little to the pressure, the iron was about one fourth thicker than where the fracture was. He ascertained it by boring a hole, and the iron at that part must have been subject to nearly the same pressure as the part which burst. That was one reason he thought it too thin; the quality of the metal is good, and the boiler well put together so far as he can judge. He endeavoured to discover the cause of the want of steam during the last voyage, and he found that considerable alterations had been made in the two midship fire-places, which prevented the fires burning, from want of draught; the lower end of the bars had been raised eleven inches higher than they had previously been (as shown by the dotted lines in fig. 1), the effect of which was to reduce the draught; the fire-place of that which burst had not been altered. The water spaces of the boilers were too small for any fire, but the fire-places of the Victoria were very large. The one under the boiler which burst, is unusually so; it is capable of being urged to a very high degree of heat. The boiler adjoining, having the same relative position to the one that burst, and having the same head of water on it, is a little out of shape, but has escaped in consequence of that furnace not being capable of being so much urged as the other. In consequence of the deficiency of steam, the furnaces in the wing boilers were required to be urged to a much greater degree than before the change was made; and he had been led to conclude that the furnace of the boiler which had burst, had been urged in a much higher degree than any other. The four transverse sections in the drawing before him, showed the process of collapse; the first (fig. 4), a little behind the bridge, exhibited the upper part of the fire tube greatly collapsed. The next (fig. 5) was taken where the principal rupture was, and the tube collapsed in an extraordinary degree. The next (fig. 6) was taken 4 feet further on than the principal fracture, where there was a fracture, but not to the extent of the principal one. The next (fig. 7) about 7½ feet further back; the further end of the boiler is not collapsed. As a matter of opinion, he should say that these collapses would not have taken place in the manner or degree they had, if they had been made upon the Cornish plan.

The Coroner—We have heard a great deal about blowing the water out of these narrow interstices by excessive heat or by a lurch of the vessel.

Mr. Ewart—I do not think a lurch of the vessel would do any such thing; but that the excessive heat acting upon such narrow spaces might have caused the steam to blow the water out of some part of the water spaces, and have let the iron get red hot.

The Coroner—Would the water be forced up so as to deceive the engineer?

Mr. Ewart—No, but an ebullition would take place, especially in Thames water, which, from its violence, might certainly deceive him as to the feed cocks and gauges; but that belongs to all boilers.

Coroner—What is the cause of the collapse you have spoken of?

Mr. Ewart—The external pressure of the steam and water is greater than the plates could bear when overheated.

The Coroner—Was any gas produced?

Mr. Ewart—No, not in this case, neither was a vacuum formed; there was no oxydation of the boilers sufficient to produce any alteration of the gases. The boilers seemed new; there was a slight scale thrown off in one place, but not sufficient to produce any such effect.

The Foreman—In her Majesty's vessels, is it usual to have machinery in the engine-room by which the engineer might have control over the satety-valve?

Mr. Ewart—Yes, Sir; we never send a vessel to sea without one.

The Foreman said, he had been induced to ask this question from observing that the engineer of the Victoria had no control over the safety-valve in the engine-room, and was in a situation in which he could not relieve himself, whatever occurred, or however great the danger might be.

Mr. Ewart—The safety-valves of the Victoria are placed in a highly improper manner. They are placed at a great distance from the engine-stage, and exposed on the top of the cook-house, so as to be accessible to every one, and liable to be tampered with, which with lever weights would be both easy and dangerous. They would not, however, be affected by a collision, except in a very extreme case. In all the Government steam-boats, and those which I have had any direction of elsewhere, the weight on the safety-valve was so placed that it could not be increased without taking part of the boiler apparatus away, which must occupy much time. I examined the glass gauges and gauge-cocks, which were of the usual construction, as were the feed-cocks also. The steam-gauge was placed in a very inconvenient situation, being at a great distance from the proper position of the engineer, and at a place where its variations cannot be distinctly observed. The feed pumps are worked by the engine, and the supply regulated by the engineer. The discharge valve from the feed pumps, to get rid of the surplus water, is very well placed, where it can be seen by the engine men. When the pump is at work, this valve is always in action, and indicates whether the pump be working properly or not. It appears to be loaded from the inside. It is difficult to say whether iron has been red hot or not, except when it has been so for a long time. I saw nothing that could enable me to say whether the boiler has been red hot or not.

The Coroner—I have to ask you a very important question. Do you think all you have described might not have occurred by the turning off of the feed cocks?

Mr. Ewart—I will try to answer it. The feed cocks are all of the same height, and each boiler has one. The turning off the feed cocks occasionally, and for a short time, does not endanger the boilers, and it appears to me that in order to expose the bottom of this boiler to the action of the fire without contact of water, the feed cocks must have been shut upwards of three hours. One reason why I think the lower collapse must have taken place in the bottom of the flue as early as in any part of the

Fig. 3.—Elevation; the left hand Boiler is shown with the fire doors removed;—the second, with them in their places; the third, at a section behind them, exhibiting the bridge of the furnace;—the fourth with the bridge and bars removed.

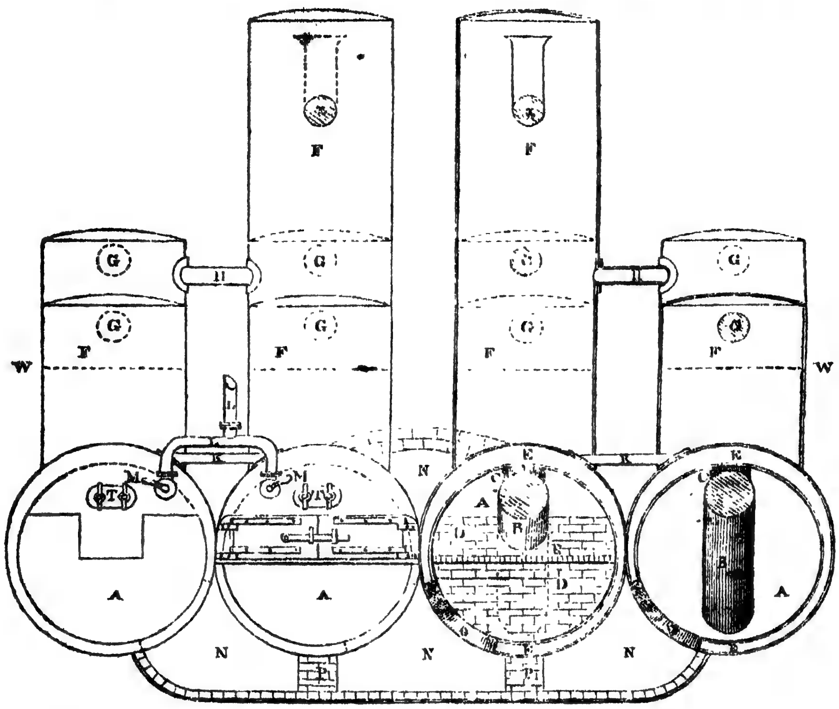


Fig. 4.—Cross Section of collapsed Boiler at *b a*.

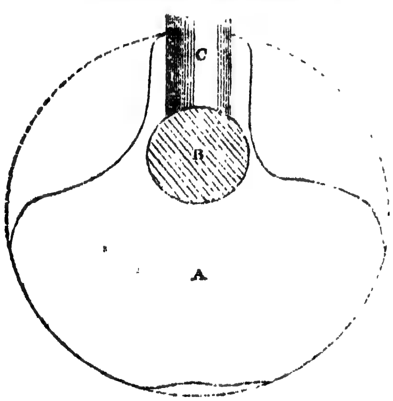


Fig 5.—Cross Section of collapsed Boiler at *d c*.

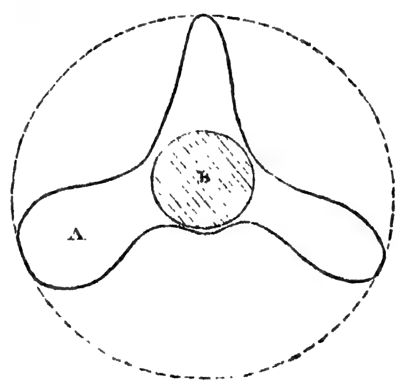


Fig. 6.—Cross Section of collapsed Boiler at *f e*.

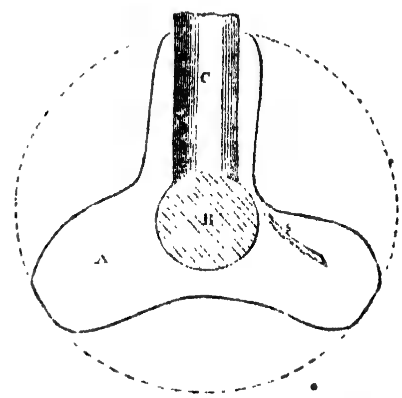


Fig. 7.—Cross Section of collapsed Boiler at *h g*.

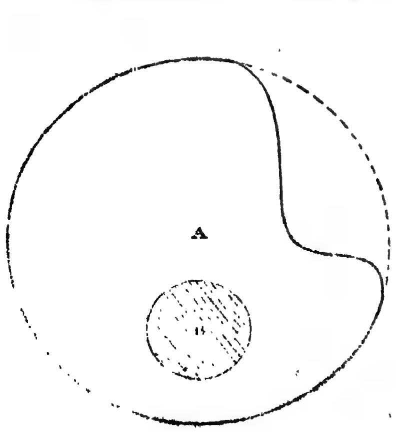


Fig. 8.—Cross Section of Victoria Boiler.

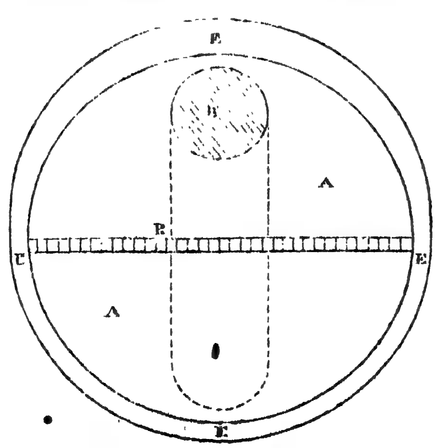
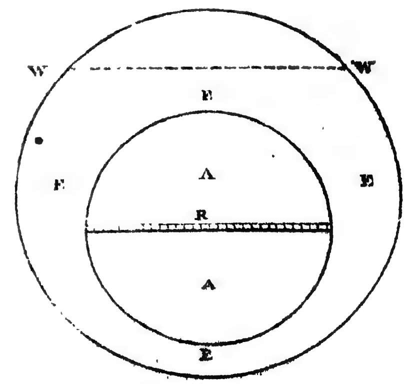
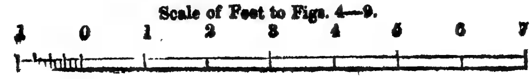


Fig. 9.—Cross Section of Cornish Boiler.



Scale of Feet to Figs. 4—9.



boiler was because it is the largest collapse; and the next because there is a second rupture, about nine feet further aft, and it appears to me that those two fractures must have taken place at the same moment, for this reason, that if one had broken first it would have relieved the other.

In answer to a question by the foreman, Mr. Ewart said they tried iron plates for boilers by submitting them to a red heat, when, if they were unsound, they would blister. Some iron was very faulty.

By Mr. Jacobs—When iron becomes heated it is softened and weaker.

By Mr. Young—It would take three hours to evaporate the water in the boiler; but I do not say that really took place. I can never believe that ten men could be so blind as to leave the cock shut half an hour, much less three hours.

Mr. Jackson—How do you account for ten men being employed in the engine-room at once?

Mr. Ewart—She has very powerful engines, and to work the valves by hand for stopping, requires five men to each engine, which is not uncommon. Immediately on the collision happening, the men were all at their post, as was right.

By the Foreman—The accommodation for the stokers is very confined indeed. There are none like it in her Majesty's service. What adds to the evil, the chimney passes through the stoke-hole, and there are no cases round the chimney, to prevent the radiation of heat. But that has nothing to do with the accident.

By Mr. Jacobs—Have often known boilers burnt for want of water; the fault was often owing to leakage; it sometimes occurs by neglect of duty on the part of the men employed.

By the Coroner—The effect of water being thrown suddenly on heated iron, if there were a great mass of it, would be to produce collapse outwards. Could not say what the thickness of the plates ought to be for high pressure engines, but the Americans had long persevered in their use, although an immense number of the most awful accidents had occurred; but of late, from the advertisements in their newspapers, he had seen that low pressure engines were becoming favourite and popular; the fact was, the American people had, at length, become alarmed.

By Mr. Jacobs—Did not think it necessary to prove low pressure boilers. Had known plates tested up to a high degree so injured by it that they were spoiled.

Mr. Jacobs—Would not that injury be almost immediately apparent?

Mr. Ewart—No, I think not.

Mr. Jacobs—Could not these boilers be so strengthened as to bear a pressure of 20lb. or more?

Mr. Ewart—It is extremely painful to me to speak upon the subject, but I must say I would not do any such thing. I would use no such pressure.

Mr. Jacobs then put a question so perfectly hypothetical that the Coroner refused to receive it as evidence.

By the Foreman—There would be a smell of burning when the water was low.

By Mr. Hall—If a vessel has been working two years with only an inch and a half water spaces, what should you be inclined to say respecting the danger of narrow water spaces?

Mr. Ewart would say nothing unless he had examined the boilers. He, however, thought if they were such, they must differ much in their construction to those of the Victoria.

By Mr. Jacobs—Had not examined the boilers that are now entire, and therefore cannot tell the thickness of their plates. Would examine them if ordered, but he should be sorry that any such duty should be imposed on the coroner and jury. (Laughter.)

Captain Bell was recalled, and asked if he heard the stokers urging each other to keep up the fires? He said he did, and that they quarrelled so much that he was obliged to check them, telling them that he did not allow such rows on board.

The ship's register, as entered at the Custom house, was here produced. It stated the Victoria to be of 538 16-34 tons burden. William Bachelor Brownlow, of Hull, and numerous other persons in Yorkshire, Lincolnshire, and London, were stated to be the owners.

Mr. Ewart then said, that as the Coroner wished to be informed on the subject of prevention, there was an easy way of discovery whether there is sufficient water in the boiler by means of a pipe, which dips to a certain depth in the water.

Mr. Hall objected, that this had nothing to do with the question before the jury.

The Coroner—I know it has not, but you do not wish to profit by anything. The Coroner and Jury do, and so do the public.

Mr. Ewart said, he was instructed by her Majesty's Government to report any plan for the safety of the public which he might be able to suggest. He then produced a drawing of a contrivance called a detector pipe, by which it clearly appeared that if there was either a scarcity of water in the boilers, or too great a pressure of steam in the boilers, or that the safety valve was impeded in its action, it would immediately call the attention of the engineer, in the first case, by a peculiar noise, and, in the last, by discharging steam from a small tube. Four of the Admiralty vessels were fitted with these tubes, and they had orders to supply them generally.

At the conclusion of Mr. Ewart's evidence, which lasted from 11 until 3 o'clock, he was complimented on the very great pains he had taken in the examination of the boilers, and his general solicitude to inform the jury.

The Jury then retired for an hour and a half, to get their dinners. On their return, Mr. Farey was called upon.

John Farey, of No. 67 Guildford-street Russell-square, stated that he was an engineer. He had been engaged in that department of science which relates to machinery and steam-engines. He had seen and examined the two larboard boilers of the Victoria. He then described the collapsed state of the flue, the fractures, one at the bottom of the flue, six feet long, and another at the side, four feet long, and these two fissures had allowed the water to be ejected with considerable violence; there was a small crack in the conducting pipe near to its connexion with the upper part of the boiler, and a small crack near to the fire-place. The water and steam issued with great violence,—that was apparent, as was shown by the brickwork being washed away. In the principal fissure above 40 rivets had been forced away. The thickness of the metal in the lower edge is only a quarter of an inch on an average, but the untorn edge is thicker by the 32nd of an inch. About nine square inches were torn away. From what he had heard of the water spaces, he should say that they were too small. In steam coaches, the necessity of lightness has led to the making of small water spaces, and it has been invariably followed by the blowing out of the water whenever the fire was disproportionate, when the iron always becomes red-hot. I think that this has placed a limit to steam coach travelling. The excessive bubbling which takes place on those occasions prevents the water being pressed upon the metal, and the consequence of this is, that steam is generated, and mixes with the water. It should be observed that these difficulties arise oftener with low pressure steam than high pressure, from the diminished bulk of the steam; and, consequently, high pressure boilers do not require so wide water spaces as low pressure to be equally secure. When he spoke of the water spaces of the Victoria being too small, it was in reference to the condition under which they worked the boilers. The fires were unusually large, and the return flues being at the bottom of the boilers, all the steam generated at the bottom of the boiler had to pass up through the narrow spaces, and, consequently, the spaces must have been filled with water and steam mixed.

The Foreman—If the supply of water had been cut off for more than the proper time, what part of the fire-tube would first become red hot?

Mr. Farey—The deficiency of water so occasioned must have been progressive, and as less and less water remained above the internal flues, it would become a mixture of more steam and less water, allowing all the upper part of the boiler to get hot, the heat being greatest at that point where the greatest proportion of steam was mixed with water, which in these boilers would not be in the highest part, because that would be kept wet by the steam and water rising on both sides.

The Coroner—You attribute the evil to the narrowness of the interstices?

Mr. Farey—That is one reason. Another is the thinness of the plates, and another the extent of the fires. I never saw any fires so large; the general size is two feet six inches by nine feet; those of the Victoria are six feet wide and nine feet long. Besides which, the boilers of such vessels are half an inch thick in metal. The pressure also was great on the Victoria boilers, being 10lb. on the square inch, while the usual class of steamers have a pressure generally of not more than 4lb., and this is the regulation in Government vessels, and amongst low pressure engines generally. While there was nothing to prevent it, competition would force the conductors of steam boats to use higher pressure, and to increase it, and consequently the greater risk would be run. There were difficulties in the way of legislating on the subject, which had been several times before the House of Commons, from the fact of there being no standard of perfection, and from a laudable fear to prevent improvements. He believed this would have been the case if any legislation had taken place on the subject 20 years ago. In France regulations had been made, but they only respected the testing of the boilers, and the consequence was that fewer accidents had happened since.

Mr. Hall—The last witness said testing was injurious.

The Coroner—Mr. Ewart said he would only use those which were strong enough without testing.

Mr. Hall—What is your definition of a high pressure engine?

Mr. Farey—High pressure engines were invented by Trevethick, who gave the name to them, and they are used for locomotive engines. Since that, Wolfe had applied the high pressure principle to condensing engines, and they were now universally used in Cornwall. A high pressure engine of Trevethick's blows the steam off into the air at every stroke of the piston. Low pressure engines worked on the high pressure principle have lately been called high pressure, and this has led to some confusion. No one will undertake to fix the point at which high pressure begins in such engines, but the extremes could not be mistaken. The low pressure engines of 4lb. on the square inch are undoubtedly the best; they are better adapted to steam vessels, and this is borne out by the Government packets.

Mr. Hall—Should you call 5lb. a low pressure?

Mr Farey—Yes, certainly.

Mr. Hall—What would you call the same engine if she was worked at 10lb.?

Mr. Farey—A low pressure engine overworked.

Mr. Hall—What would you say if it was worked at 15lb. or 20lb.

Mr. Farey—Still more overworked; and then an apparatus for the expansion of the steam in the cylinder must be provided.

Mr. Farey further gave a most minute description of the boiler that burst on board the Victoria; but as it entirely coincided with that before given by Mr. Ewart, it is unnecessary to insert it.

In answer to a question from Mr. Hall,

Mr. Farey said that high pressure engines, as applied by Wolfe, were very popular in France, and that boilers of this sort were superior to the high pressure boilers of England.

On the whole, he considered that the accident arose from a concurrence of unfavourable circumstances in the construction of the boilers, as they required very urgent fires to enable the engines to do their work; the water spaces were too narrow compared with the width of the gratings; the metal of the internal tube was too thin compared with its diameter; the load on the safety-valves greater than such a tube was qualified to work under; and the heads of water over the boilers, deficient in extent, which ought to be continuous throughout.

A discussion here took place as to the propriety of adjourning, but it was at length determined to hear the evidence of

Mr David Napier, from whose designs the boilers on board the Victoria were made. That gentleman being sworn, deposed as follows:—I reside at Blackwall, and am an engineer, and have been all my life engaged in that business. I am 47 years of age. I was brought up under my father, who was an engineer, and practised at Glasgow, where I had extensive works. I have ceased to follow the business for three years, owing to bad health. I have fitted a great number of boats with engines and machinery. I made the boiler for the Comet, the first steamer that was employed for practical purposes in Europe. I do not now recollect whether it was from my design or not. I was the sole owner of the Rob Roy, the first steamer that navigated the open seas.

Mr. Jacobs said he would put in a report of a committee of the House of Commons, in which was the evidence of Mr. Napier, relating to the employment of the Rob Roy between (Liverpool and?) Greenock and Glasgow, the first time that a steamer was usefully applied in the open sea.

Mr. Jacobs—You made the engines for the Talbot and Ivanhoe?

Mr. Napier—I did. They were the first steamers that ran between Dublin and Holyhead. I constructed the engines for the Belfast, Eclipse, Superb, and Majestic. They were the first vessels of a powerful description that completely succeeded on the Liverpool and Greenock passage. They were employed by the Government to carry the mails. About two years ago, the engines of the greater part of the sea-going vessels out of the port of London were made by me. Among these were the Belfast, Mountaineer, and United Kingdom. Several belonged to the General Steam Navigation Company. Had made boilers of the width of those in the Victoria in the water spaces. The Loch Lomond upon this principle has been plying three years, and I never heard of the least inconvenience from the width of her water spaces, and not sixpence has been incurred in repairing them. They are precisely

the same as those in the Victoria. When I went to Glasgow a month ago, I found other engineers copying them, so satisfied were they of their efficiency. Two of the Victoria's boilers are now as perfect as when they were originally made. I made them all from one plan. I am a judge of the power of the engines from their practical use. When the Victoria came up, she was working at much less power than when she went down. Horse-power was an indefinite term, and depended on the pressure of steam.

The Jury said that they were receiving a new light; steam-vessels were generally set down as so many horse-power. When a vessel was advertised of 300 or 400 horse-power, could Mr. Napier say what was meant?

Mr. Napier—I really do not know. The engines of the Victoria might be worked up to 400 horse-power.

In answer to a question by the Coroner,

Mr. Napier said that he considered the blowing out of the water from the interstices all nonsense.

A Juror—You won't make me believe it nonsense, though.

Mr. Jacobs and Mr. Hall said that was giving an opinion, and that they might as well withdraw at once.

Mr. Napier then stated that he had made the engines of the Chieftain, for the Mediterranean, with boilers of the same construction, but with only one inch and a half water space. The boilers were a little less, and nearly five feet in the tube. The fire-places were five feet wide, and of the same description as in the Victoria. The cylinders of the Chieftain were 48 inches, those of the Victoria 64 inches, and the plates of the boilers were a quarter of an inch thick.

By a Juror—Did not know that the Chieftain had been on fire, or that she was now laid up.

By Mr. Jacobs—No engineer who did his duty could be deceived by the boiling of the water. An engineer who did his duty would always keep the water at the same level, and so regulate the feed cocks as to effect that object.

By the Coroner—Did not know by whose orders the gratings were altered. He saw the Victoria coming up the river on the day the accident occurred, about 5 miles below Woolwich; the Wilberforce was astern of her, and witness was surprised to see them so close together. Considered the Victoria could beat the Wilberforce. At Blackwall the Victoria again began to go much slower; the Wilberforce was then gaining upon her. I watched them, and just above Greenwich the Victoria increased her speed. I did not see her stop at all. When she passed the City Canal I still had my eye on her, and she was then going much faster, and I saw steam blowing off, and I concluded that the engineers had been pinching the feed pipes and getting up more steam, in order to get to London first, when they saw the Wilberforce was gaining on her. I believe she would have gone to London safe, but for the collision with the brig. The engines were stopped, and the steam suffered to accumulate, which caused the explosion. The engineers were, in my opinion, neglectful of their business. They ought to have eased the safety valve.

The Foreman—That is the reason why the engineer should have control of the safety valve in the engine room.

Mr. Napier—The boilers were overheated, and then a slight pressure of steam would injure them. The engineer ought to have removed the extra weight on the lever at Blackwall, going and coming, and the accident could not have occurred. It was excessively stupid his having it on; the difficulty in backing astern was accounted for by that. Recommended plates a quarter of an inch in thickness, and that they should be tested to three times the pressure intended to be used, and if they exhibited any signs of weakness, to use increased strength. Had made a boiler for the Postboy steamer, which had worked six years without accident, and the water spaces were only one inch and a half. The Postboy was in constant use, and was of 24 horse power.

Mr. Napier then referred to his evidence respecting steam coaches, and said that he had made one, and that the cause of their failure was not the blowing of the water out of the tubes, but the great weight of the carriage on a common road. He had wasted 1,000*l.* in experiments with steam coaches. With respect to the blowing out of the water from the narrow spaces of the Victoria, he was ready to give 10,000*l.* to the poor of the parish of Shadwell if any one could prove it could happen. If the plates had been double the thickness, and they had been allowed to get red hot, the same results would have followed. The plan recommended by Mr. Ewart for discovering deficiency of water in the boiler, was used by him 20 years ago, and not found to answer in many vessels. The Cornwall land-boilers could not be used at sea. The safety-valves of the Victoria were, in his opinion, properly placed; they could not be better.

By the Jury—The Earl Grey engines and boilers were made by me. She exploded in the Clyde, and lives were lost. Her boilers were square ones, and I recommended the owners of the Victoria to have four circular boilers, for I do not consider the square ones so safe. There was an explosion on board the James Ewing. The engines and boilers of that vessel were made by me, and a loss of life ensued. The boilers of the James Ewing were not constructed the same as those of the Victoria.

The Coroner said he would read over the voluminous evidence already given by Mr. Napier, and proceeded to do so Mr. Baker had not proceeded far when

Mr. Napier said he wanted the words of the report of the House of Commons to be given *verbatim* respecting the vessels for which he had made the engines and boilers when steam navigation was first introduced.

The Coroner said, he could not take the report of a Parliamentary committee as evidence. After a long dispute with Mr. Napier, he added the words "as so reported by a committee of the House of Commons," after that part of the evidence relating to the various steam-vessels and the introduction of steam navigation into Europe.

Mr. Napier having signed his deposition, the inquest was adjourned till Tuesday, the 31st of July.

EXHIBITION AT THE ROYAL ACADEMY.

ARCHITECTURAL ROOM.

(*Concluded from page 255.*)

There are as usual several designs for private residences, yet very few to which any particular merit can be allowed on the score of tasteful design, although the buildings themselves may be agreeable enough, but owing to circumstances entirely independent of architectural quality. One of those most distinguished by this latter, ought to have been noticed before, namely 1070, "The Rectory House, Kingsworth, Hants," J. Buckler. It is a spacious mansion in the Tudor style of dark red brick, the principal portion of which forms a lofty, tower-like mass, and it has also very lofty and rich chimney stacks. The character is so well kept up that it might pass for a genuine remain of the olden time, but whether it is in consequence less eligible for the purposes of a modern residence than otherwise might have been, it is impossible to judge from a mere view. Unless too much has been sacrificed to picturesqueness of exterior appearance, it is very commendable, and emphatically old English. Although somewhat similar as far as the adoption of style goes, No. 437, "View of a Mansion to be erected near Cape Town, for Baron Van Ludwig," H. C. Vogel, is utterly dissimilar in feeling, nor is the style itself recommended by any propriety in the selection of it for the country where the building is to be erected.

No. 1144 "View with slight alterations of a Mansion in Hants," C. Miles, is also an exceedingly poor affair: it would require not 'slight' but very great alteration indeed to render it at all tolerable.

No. 1145 "Design for a Mausoleum to be erected at the Cemetery Kensall-green," T. R. M'Quoid, is a sepulchral structure displaying much elegance of taste, in a subject which is undoubtedly very favourable, as it is one where classical prototypes may be followed without depravation occasioned either by addition of what is foreign or suppression of what essentially belongs to them.

We can likewise speak very favourably of 1152 "Design for a Gothic Altar-piece," J. Taylor Jun. treated as a screen over which is seen a window, and behind which, we presume, the vestries would be placed. But we further presume that anything of this description would stand but little chance of obtaining favour with the Church Commissioners, especially when we behold them sanctioning and adopting such designs as 1157, "New Gothic Church as approved by the Metropolitan Church Commissioners, and now commencing in the New North-road, Islington, from the Designs of Messrs. W. and H. W. Inwood." This is the very consummation of paltriness,—a degree worse if possible than Messrs. Inwood's Somers-town Chapel, which we should have thought that Welby Pugin had recorded sufficiently in terrorem.

The next No., "Proposed Front for a Town Mansion," J. Bell, is upon such a scale that it does not look as if it was proposed in earnest,—at least not with any chance of being adopted for any private mansion in London. It has much more the air of being a design for a Club-house than a private residence. It consists of three series of windows, seven on a floor, all very much enriched, besides a range of smaller windows, immediately below the cornicione which finishes the elevation, and with the windows constitutes its chief decoration. There is certainly something grandiose and commanding in the general aspect; yet in our opinion it might have been equally so with a little more refinement of form; for it must be confessed that the three centre windows of the principal floor, look overdone with decoration, and even top heavy. The composition of the entrance too, having a diminutive window on each side of the door, is by no means unexceptionable. One thing which deserves to be noticed as contributing very much to the grandeur and breadth observable in this front, is the great width of the extreme piers or spaces beyond the windows.

Nos. 1162, 3, and 4, are all by Sir J. Wyatville, and the first and third represent the Victoria and Winchester Tower at Windsor Castle, the other "a Design formerly approved for adding to St. James's Palace." They do not obtrude themselves upon notice, for they are three of the smallest drawings in the room,—and so far no one can grudge them the space they occupy; and they are likewise those which make, perhaps, the least pretension to pictorial or artistical effect of any kind, for they appear to have repudiated it altogether. In fact, we never before beheld any executed in such an exceedingly dry, little, and *niggling* manner: they have the look of being pencilled on china; nor are they one whit less singular for their colouring than for their drawing. Nevertheless they are so exceedingly small, that notwithstanding their singularity they are likely to escape notice altogether; for unless he consults his catalogue, a person would pass them by without at all suspecting them to be what they really are. Flatter they certainly do not; but we should hope both for the credit of Windsor Castle and Sir Jeffery himself, that they actually belie those parts of the building they pretend to show; else the style of the architecture must be as harsh, as bald, and as dry, as that of the drawings themselves. As to the other design, we can truly say we rejoice that it has never been executed, for however much it may have been "formerly approved," we do not think it would be at all approved now. To be sure, much cannot be made out; yet as far as we can make it out, it seems but one degree superior to carpenters' Gothic. Had these drawings not come from Sir Jeffery himself, we should say that he had been treated as unfairly as Mr. Barry has in No. 1117; but as it is, we hardly know what to think. We have however very strong misgivings; and only hope we may not discover that the architectural merits of Windsor Castle have been magnified exceedingly far beyond the truth; and that it is only in consequence of its being less accessible and less within the sphere of general observation that it has hitherto escaped the criticism which has treated many other buildings so very roughly.

We take the liberty of passing by Mr. Gandy's drawing (1165) merely remarking that if the page of letter-press attached to it in the catalogue does not sufficiently elucidate it, we cannot possibly attempt to explain in a paragraph what it would have taken us a day to study. The same remark will serve for his other drawing, 1172, a Design for the Ceiling of a Library; which is so far appropriate as it seems to be a very learned composition, but all its mystic erudition we apprehend, is sadly thrown away upon the visitors to the Exhibition.

Mr. Salvin's name excited expectations which are not fulfilled by No. 1171, "Scotney Castle, Kent, the Seat of Edward Hussey Esq. now erecting." It has far more the appearance of an old house, enlarged or altered, than of one entirely built from a design made purposely for it. What might be tolerated in the former case from necessity, becomes in the other positively offensive and defective. Neither does it present any individual features of sufficient beauty or value in themselves, to atone, as sometimes happens in such cases, for the mediocrity or worse than mediocrity of all the rest.

It is impossible to overlook No. 1177, "New County Courts, Worcester," C. Day, for it is one of the most strikingly and powerfully coloured drawings in the room. The design itself is good, as a mere copy of Greek, beyond which the architect has not at all taxed his invention,—for the façade consists only of an Ionic hexastyle portico, with one large doorway within it. This is certainly stealing brooms ready-made.

We thought we had dispatched all the "National Museum" designs in our last notice, but we now stumble upon another, 1177* by H. L. Elmes, "comprised within a space of two acres." It is not without merit in its composition, though rather extravagant and overdone; and we apprehend too that the idea of introducing a Grecian Doric structure over the centre of the principal mass, which is Corinthian, would be reprobated as an egregious solecism.

No. 1189 "Design for a Triumphal Monument," C. Viner, is so coloured that it looks as if it were intended to be constructed of ice; which would certainly be the most suitable—the only suitable—material for it, it being a "monstrosity" from which a thaw would relieve us. What triumph it may be intended to celebrate we know not—but most certainly it cannot be the triumph of art. However perhaps some confectioner may be smitten with it, and resolve to execute it if not in ice, in blanc manger.

After such an enormity, it is quite refreshing to look at something of the quality of 1193, "Design for a Baronet's Chapter or Club-house," H. Duesbury. But we are quite upset again when we turn our eyes to its neighbour 1194 "A National Repository of Arts and Sciences," J. Tarring, which is a farrago made up of the Dome of St. Peter's, and a huge mass of building; just as 1227 is of that of St. Paul's with an accumulation of piled up structures around it. This last, by-the-by, is another "National Museum," compared with which the British Museum becomes little more than a raree-show box.

For these dull extravagances we meet with some amends in No. 1195, "Original Design for Grosvenor Square Chapel, Manchester," H. Roberts. Whether by "Original Design" we are to understand that the building itself will be according to one which has been altered from this, we do not exactly know, but suspect such to be the case; and if so we are afraid that we cannot judge what the Church is to be, from what we here behold. The style is the earliest English or lancet Gothic, and in a far fuller and richer manner than is usual in any imitations of it. The composition is very pleasing and chaste,—broad, simple, and effective, free from any of that littleness and poverty which are the besetting sins of so many of our buildings. Below there are five doorways of lofty proportions, with deep splays decorated with shafts; and each doorway is surmounted by a gable or pediment. Three of them are in the centre compartment of the front, whose divisions are formed by rich buttresses terminating in polygonal pinnacles.

No. 1202, "Barcomb, South Devon, now building for N. H. Nugent Esq." E. Davis, is a strange medley of styles tastelessly jumbled together. If an architect is positively compelled to minister to the bad taste of his employer by perpetrating such things, he is in some respect to be pitied as well as censured,—that is, censured for not palming upon the other something like propriety, and imposing upon him something like good taste, while professing to accommodate himself entirely to his barbarous notions. If on the other hand, the offence be entirely his own, he ought to congratulate himself, that huge as is our statute book, it contains not one statute against such misdemeanor. It is indeed fortunate for many, that outrages of this kind, however gross and unpardonable, are not indictable.

No. 1208 "Sutton Hill, a house lately erected for Captain Richardson, in the Parish of Barcombe, Sussex, by W. Moseley," is a very different kind of design from the other Barcombe above mentioned. Though but a moderate-sized house, there is something bold and picturesque in the general composition, and some good detail. No. 1220 "Design for a Mansion," H. Smith, is likewise a very good subject of the same class. But "angels and ministers of grace defend us!" Why are our eyes to be afflicted with the vision of such things as No. 1214 "Design for a Union Workhouse," C. Eales. We grant that we do not expect any beauty in such a subject—res ornari negat. But then, in the name of common sense, wherefore should it be paraded before us in an exhibition, when the only excuse for introducing anything of the kind would be, for the purpose of showing how it could be rendered a picturesque if not a beautiful object?

No. 1226 "Church lately erected at Honiton," is one of the best designs, by Mr. Fowler, we recollect to have seen. It would be but a poor compliment to say the same of that (1245) erected at Goring, near Worthing in Sussex, by Mr. Decimus Burton. It is nevertheless a very good modern specimen of a village church, and beyond all comparison better than many of the churches lately erected about town.

Why such a drawing as No. 1237 "Elevation and Section of the Tower and Spire of St. Vedast," should be hung up, unless to cover so much wall that would otherwise have been left bare, we cannot conceive. Mr. C. Davy, whose name shows itself so conspicuously on the frame, has no more claim to the merit of it,—if merit there be any in it,—than has the compositor to this article of ours;—which we here bring to a close.

IRISH RAILWAYS.

(From a Correspondent.)

The following is a list of Irish railways, perhaps more detailed and exact than any that has yet appeared. It is furnished with a view of reconciling what might otherwise appear to be a contradiction in the subject matter of two communications regarding Irish railways in your journals of June and July. In the list of Irish railways published in that for June 1838 (p. 234), it was not intended to give any account of what lines of railway the Irish Commissioners had surveyed through Ireland, or indeed anything connected with their operations; because nothing has yet been publicly made known regarding the labours of that Commission. Such being the case, any communication made on that subject being unofficial and unauthorised, or at least bearing no record of any authenticity of that kind, can only be received by the public at present as purely conjectural. But on the other hand, if your second correspondent be officially connected with the Irish Railway Commissioners, a list of the railways proposed by them through Ireland, the direction and length of each line, gradients, probable expense of construction, and probable amount of revenue &c. &c., would be very interesting to the public. If at the same time, he could give a statement of the circumstances which have induced the great delay that has occurred in the presentation of the report itself to parliament, and point out the modifications which are understood to have been introduced more than once into some of the principal lines, he would deserve the thanks of the Irish public.

The account of the Irish railways contained in your journal for July 1838 (p. 264), whether as regards the proceedings of the respective companies, or even perhaps those of the Irish Railway Commission, must be viewed by those acquainted with the subject as extremely defective; but it is to be hoped that your correspondent will be able to give to the public in your next number, something that will remove the grounds of complaint against the list he has already given.

DUBLIN AND KINGSTOWN RAILWAY.

This railway was originally designed and laid out by the late talented engineer Alexander Nimmo Esq., who died while the bill for it was being carried through parliament; Mr. Vignolles then became the engineer.

WATERFORD AND LIMERICK RAILWAY.

This railway was first surveyed by Elmes and Hollingworth, Architects and Surveyors, who were paid six or seven hundred pounds for their surveys of the line: afterwards Mr. Nimmo was employed to survey and report on it; his survey was lithographed and his report printed. The report is a most interesting document; and to those who are capable of appreciating its merits, the information it contains, and descriptive style of language, unfold the highly gifted powers of its author. An act was obtained for this railway, but it has expired. Mr. Thomas Telford, examined that part of Ireland and reported on this railway favourably. The country was also examined and the railway reported on, by Mr. George Stephenson.

And again by order of the Board of Public Works in Ireland, this project was examined by Mr. Bald; and on his report an offer was made to the company by government of a loan of one hundred thousand pounds sterling, provided that a subscription to that amount could be obtained to carry it on. This was not accomplished, and accordingly the government did not advance their loan.

In the autumn of 1836, a new Company was formed with a most influential committee, on which by vote of the board, the chairman and two directors of the Great Western Railway accepted seats. The object of this company is to effect a new survey and obtain a new bill in parliament; these proceedings are only suspended out of respect to the Irish Railway Commissioners; they have nominated, I. K. Brunel F.R.S. &c., Consulting Engineer;—and William Bald F.R.S.E. &c., Directing Engineer.

RAILWAY FROM CAVE-HILL TO BELFAST HARBOUR.

An act has been obtained for this Railway; the works are progressing, but some difficulty exists in fixing on the terminus at Belfast Harbour, which cannot be decided on until some of the various plans of improvement for that port are adopted. By order of the Board of Works in Ireland, Mr. Bald examined and reported on this railway; and a considerable sum is ready to be advanced by loan towards its completion when application is made and security given. This railway is for the purpose of carrying limestone down from Cave-hill to Belfast harbour for export, and it is considered by every person that when finished it will be one of the most useful railways yet planned in Ireland.

RAILWAY FROM DUNDALK TO CAVAN.

An act has been obtained for this railway; Mr. M'Neil Engineer.

RAILWAY FROM DUBLIN TO GALWAY.

The line of this railway was traced out by Mr. Bald and Mr. Henry, and a minute survey has been made of the Western branch from Athlone to Galway by the latter. No act has yet been obtained for it, but the plans are before the Irish Railway Commissioners; and a London board composed of eminent bankers, merchants, and Irish landowners is ready to proceed with the project.

DUBLIN TO DROGHEDA.

An act has been obtained for this railway;—Engineer William Cubitt Esq., F.R.S. M.R.I.A. &c.

ULSTER RAILWAY, BELFAST TO ARMAGH.

This railway was designed, surveyed, and levelled, under the direction of Mr. Bald and Mr. Woodhouse, and an act obtained for it;—Consulting Engineer, Mr. George Stephenson.

RAILWAY FROM DUBLIN TO MULLINGAR.

This railway has been surveyed and levelled under the skilful superintendence of Mr. Alexander Nimmo, nephew of the late eminent engineer of that name, and a report written by him has been printed, but no act has yet been obtained;—Engineer, Mr. Charles Vignolles.

RAILWAY FROM DUBLIN TO KILKENNY.

An act has been obtained for this railway; but by a clause in the act, its construction has been restricted for one twelve month, beyond a distance of seventeen miles from Dublin. The effect of this restriction has been to prevent anything whatever being done, up to the present moment;—Engineers, John M'Neil and David Aher, Esqrs.

RAILWAY FROM DUBLIN TO LIMERICK.

This proposed railway has been surveyed and levelled under the direction of Mr. Bald the engineer, by order of a most respectable board of London directors, elected at the instance of the Chamber of Commerce and principal merchants of Limerick, for the purpose of carrying this undertaking into execution.

RAILWAY FROM CORK TO COVE.

An act has been obtained for this railway;—Mr. Vignolles, Engineer.

RAILWAY FROM BELFAST TO HOLLYWOOD.

This railway will embank in from the sea more than 1200 acres of rich sea land; no act has yet been obtained;—Mr. Bald, Engineer.

RAILWAY FROM DUBLIN TO ARMAGH;—INLAND LINE.

This line of railway was first surveyed and levelled under the direction of John Urpeth Rastrick Esq. Engineer; and it was again traced and surveyed under the direction of Mr. Bald. The plans, maps, and sections, have been all finished, but no act has yet been obtained;—John Urpeth Rastrick Esq. Consulting Engineer; — William Bald Esq. Directing Engineer.

RAILWAY FROM DUBLIN TO ARMAGH;—BY THE SEA COAST.

This railway was surveyed and plans made; but no act has yet been obtained;—William Cubitt Esq. Consulting Engineer;—John M'Neil Esq. Directing Engineer.

RAILWAY FROM BELFAST TO CARRICKFERGUS.

This line of railway was traced out by Mr. Bald; the whole length is one continuous level, and it was calculated to embank in from the sea 1500 acres of rich sea land.

By order of the respective companies, copies of the surveys for the following lines of railway were delivered into the office of the Irish Railway Commissioners in the autumn of 1836, viz.,

Dublin to Limerick.
Dublin to Kilkenny.
Dublin to Armagh.
Belfast to Hollywood.
Limerick to Waterford, &c. &c. &c.

P.S. It has just been announced that the Irish Railway Commission are about presenting their report to parliament; and on reading over the extracts taken from it and published in the Sun of Friday, July 20, we believe that the intention of the government in issuing a royal commission to lay out a system of railways through Ireland has been of the most laudable and praiseworthy kind; but whether the commission will confer the benefits contemplated or not, time only can unfold. Without reading over the whole of the report, it would not be fair to enter on a discussion of any of the very many points which are even put forth in the extracts contained in the Sun newspaper above alluded to; but it may be observed that the system of railways laid out by the Railway Commission in the South of Ireland, is at variance with all the lines proposed by the respective companies in that great district. Looking at the composition of the royal commission, their practical skill, their experience in railway engineering, and power to decide on matters of so serious and so professional an import, where many millions sterling are perhaps to be expended, the legislature will no doubt avail themselves of the highest practical skill and talent that the empire can afford, to examine and decide on what may be considered in their opinion the best lines of railway for Ireland. Reason and good sense ought to impress this on the attention of the executive, as the only safe mode of proceeding, where so much difference of opinion exists, and where so much capital is to be expended. It ought to be borne in mind, that the railways projected for the South of Ireland, and to which independent companies had offered to devote their capital, had previously been reported on by the most eminent practical engineers that the empire has produced; we need only mention Nimmo, Telford, and Stephenson, to convince the reader of the truth of this statement. The most serious consideration will therefore be required before the suggestions of this commission are adopted, to the prejudice and suppression of the views of such men as those we have named. There is another proposition contained in this report, which will doubtless prompt still more serious reflections. The commissioners—after regretting that England should be the only country in which the construction of railways was left to the independent enterprise of private companies, and pointing out that the less perfect system of government in America did not admit of a better arrangement in that country, and stating that in France a more powerful government had taken the prosecution of such works into its own hands—call upon the British government to subject all the railways in Ireland to one body of capitalists, whose proceedings are to be under the management and control of Ministers.

THE THAMES TUNNEL WORKS.

RETURN TO AN ORDER OF THE HON. THE HOUSE OF COMMONS, DATED JUNE 27, 1838, FOR COPY OF MR. WALKER'S REPORT TO THE TREASURY ON THE WORKS AT THE THAMES TUNNEL.

I duly received a letter from Mr. Baring, under date the 7th of October, 1837, informing me "that the Lords Commissioners of her Majesty's Treasury had under their consideration a report from the clerk of the Thames Tunnel Company of the 13th September, with an account of the breaking in of the river on the 23rd of August, 1837, and various papers relating thereto, which, with the former report from the same party, and special reports from Mr. Brunel of the works proposed to be carried on at the Tunnel, were referred to me for my consideration and report, previous to their Lordships giving any direction on the application for consent to the several propositions made by the engineer and directors of the Company for continuing and facilitating the progress of the works."

I gave the subjects my immediate attention, and was preparing a report thereon, when on the 2nd of November another (the fourth) irruption of the Thames took place, and on the 6th, when I visited the works of the Tunnel, Mr. Brunel, the engineer, and Mr. Charlier, the secretary, requested a postponement of my report for a short time, until they should complete an expected arrangement with the navigation committee of the river Thames, from which they expected increased facility and security. This request I communicated to Mr. Baring by letter on the 9th of November.

I have since seen Mr. Spearman's letter of the 2nd of December, transmitting to me, by command of the Lords of the Treasury, a copy of a letter from the secretary to the Thames Tunnel Company, dated 15th November, together with a report of Mr. Brunel on the present state of the Tunnel, and the best mode of proceeding, and also a plan of the works, with a request that I would communicate to their Lordships my opinion upon the several points referred to in the papers, previous to their determining on the proposals and recommendations of the company.

Since receiving the above instructions, Mr. Spearman has stated to me the desire to be, that every point, particularly as respects cost or estimate, which I consider of importance in the general question of the Tunnel, should be included in my report, so as to bring the whole fairly under the consideration of their Lordships.

That Mr. Brunel's different reports, in which the same recommendations are repeated, may be brought to their Lordships' recollection, I shall give a short abstract of the main points in the order of date.

In his report of May 2, 1837, Mr. Brunel ascribes the difficulties which had retarded the progress of the Tunnel for the last five months to the excessive rains of the preceding autumn liquifying the ground between the ceiling of the shield and the river, and causing it to run into the works; he states that this has been augmented by his being deprived of the pumping well and drain from Wapping, which is stated to have been originally intended, and to have been considered the most efficient means of drainage, particularly as the dip of the strata is to that side, and that before any satisfactory progress can be calculated on, the proposed pumping-well, with a drain or drift-way, should be made, but that a preferable plan would be to sink the 50 feet shaft for the foot passengers' descent, which would, he considers, be a better means of drainage, and would give employment to the workmen when not in the shield. The fact of the pumping at the entrance of the London Docks having dried the wells in that neighbourhood, is adduced as a proof that a pumping-engine on the Middlesex side would diminish the land-springs in the Tunnel.

Mr. Brunel estimates the expense of the shaft, including the steam-engine, pumps, &c., at 6,814*l*., and the pumping-well alone at 2,990*l*., independent of the drift-way or drain, which he calculates at 4,310*l*., making together 7,000*l*., which sum he presumes would be saved by forming the shaft rather than the well at the present time, exclusive of keeping the workmen and establishment employed, and thereby reducing the amount which is now charged to the tunnel account. He also mentions the impregnation of the water with sulphurated hydrogen, which has proved very injurious to the health of the workmen, as another reason for making the drift-way, as it would be the most effectual means of drawing it off. The report states, that "the fact of 16 feet of the Tunnel having been completed under the described difficulties, is a proof that it can be accomplished, though, owing to the disadvantages, at an enormous price, and that it never could be intended in the conditions of the Treasury that he should be deprived of the means of completing the work at the estimated cost."

Mr. Brunel's report, dated 9th of August, 1837, recapitulates the substance of his previous report, and adduces the successful result of pumping-engines and drift-ways erected for the purpose of taking off the land-springs that impeded the formation of the Kilsby tunnel, in the line of the Birmingham railway, as a proof of the good effect that would be felt in the works of the Thames Tunnel, by a pumping-engine on the Middlesex side. He states also, as an argument for the works he proposed in his former report, the importance of giving the disturbed and artificial ground time to consolidate; and now proposes, on the completion of the Middlesex shaft, to commence the tunnel on that side also, with a view to greater expedition and economy, and to keep the full complement of men more regularly employed by having the two ends to work at. This, it is stated, would reduce the cost of conveying the men, materials, and excavation to the shaft on the Surrey side. In this report Mr. Brunel further states, that so soon as the plan he has proposed is in satisfactory operation, the formation of the carriage-roads might be commenced simultaneously with the tunnel; and that by the various means he now proposes, a saving might be effected in the time of four and a half years,

which in my report of April, 1837, I considered requisite for the completion of the tunnel and approaches, and that consequently there would be an earlier receipt of toll, and a saving of current expenses and machinery to the amount of 15,000*l.*, by the works being completed one year and a quarter within the time I had calculated. Various accounts and calculations in proof of his several positions are appended to this report of Mr. Brunel, and an estimate that to carry on the works as he recommends, the sum of 94,000*l.* will be required during one year from August, 1837.

The Lords Commissioners of her Majesty's Treasury having refused their assent to the tunnel being begun on the Middlesex side, Mr. Brunel, in his report, dated the 7th of September, 1837, repeats the other recommendations of his former reports.

The last report of Mr. Brunel that is referred to me, is dated the 15th of November, 1837, the fourth irruption of the Thames having taken place on the 2nd of that month. In this report, he considers the third irruption (that of the 23rd of August) as not having been unfavourable in one point of view, as it would enable substantial ground to be substituted for the loose silt that had been worked into the tunnel by the irruption; in proof of which he states that the work done before the third irruption cost 900*l.* per lineal foot, while what was done between the third and fourth irruptions cost only 630*l.* The former recommendations and arguments are repeated, and in addition it is now stated that the fourth, or last irruption, was caused in a great degree by the part of the tunnel then in progress being under the portion of the river chiefly used for navigation, and that the depth being small, the artificial bed of the river, or roof of the tunnel, was liable to be disturbed by passing vessels. This Mr. Brunel now proposes to remedy by deepening a part of the river where the tunnel is formed, moving some of the ships in the tiers near the tunnel from the northern to the southern side of the river, according to a plan which accompanies his report, throwing the space which is required to be kept clear for the navigation, from the north side towards the middle of the river over where the tunnel is formed, so as to leave the space which is in advance of the works free for tunnelling operations; and then substituting a thicker roof of clay and gravel raised above the present level, to which, from the navigation not being then over that part, there would not be the same objection as at present. This thicker roof Mr. Brunel proposes to make 100 feet in length, or in advance of the shield, and 100 feet on each side of it. He calculates on a great saving in the end from this artificial covering, which he estimates at 1,800*l.*, and ascribes much of the late trouble and expense to the passing ships, and the want of a sufficient thickness in his roof, which the navigation prevented his having.

The reports are drawn up in great detail, and the above abstract is to be considered not as a substitute for them, but only as bringing the leading points to recollection in one view, without the repetitions which the reports themselves, being of different dates, naturally contain.

It is now my duty to state my opinion, which is, to recommend Mr. Brunel's proposals to be adopted as the most economical and creditable way of executing the works, if it be the determination that the Thames Tunnel (a work which for many years has attracted much of the public attention in this, and still more in other countries, and upon which upwards of 80,000*l.* of public money has been advanced) shall be completed, without making cost an element in the question. I would then even advise more effectual works in front of the shield than Mr. Brunel's description and estimate of 1,800*l.* contemplates; for if the work is to be considered a national or government work, a repetition of the danger, the late irruptions, and the enormous expense of the work, would be discreditable, and as it may be, it ought to be prevented. In addition to Mr. Brunel's proposals, I would recommend, after the removal of the clay that has lately been thrown in, and a portion of the silt, that two rows of close whole timber piles should be driven between where the ground begins to rise and the present shield, one row on each side of the line of the tunnel, with space between sufficient for the shield to travel, and to as great a depth as they can conveniently be driven, the heads being level with low water. These, with a return of shorter piles at the end, would form a dam against the silt. The piles being driven, I would continue the dredging of the silt in the space enclosed by the piles, and then fill up with clay, gravel, &c., as at present, to a sufficient height, and afterwards give the mass time for consolidation before attempting to advance the shield, which in my report to the Commissioners for the loan of Exchequer Bills, I stated to be an essential element for success in the undertaking. In the progress he has made through very bad strata, Mr. Brunel has fully tried and proved the great power of his excellent shield; but the strata, rendered worse by the irruptions and the causes assigned by Mr. Brunel, are now too bad for even the shield to overcome. By the substitution of good artificial soil to work through, and keeping the silt or sand back by the piles, there would be much less difficulty or danger; and with proper precautions, my decided opinion is, that the tunnel may be completed notwithstanding the late irruptions, and with comparatively little difficulty or risk.

Here the question naturally presents itself, at what cost? and to answer it it with the probability of accuracy is still very difficult.

The amount of the company's capital expended previous to any advance of public money was 180,000*l.* On the 27th of February, 1837, when 64,600*l.* received from the Commissioners for the Loan of Exchequer-bills had been expended, I estimated the	64,600
addition then required to complete it, at - - - - - -	310,600
Making, exclusive of the company's capital - - - -	£374,000

Between the 27th of February and the 2nd of November, 19,300*l.* have been expended, making 83,900*l.* of public money expended to the 2nd of November, but the quantity of work done with the above 19,300*l.* is only 19 feet six inches, making (inclusive of 1,400*l.* for pumping, excavating, and claying, after the third irruption) nearly 1,000*l.* per foot, which very much exceeds all previous estimates, and proves what I stated in evidence before the Select Committee of the House of Commons, that no prudent man would commit himself to the accuracy of an estimate of this work, while it shows also the impolicy of attempting to drive on the shield through the present bad soil without a sufficient covering and time for consolidation.

In the present situation, I consider that the sum of 150,000*l.* should be taken as the estimate for completing the tunnelling; and that the shafts and other works remaining to be done, together with the purchases, should not be estimated under 200,000*l.*, making, with the 84,000*l.* of public money already expended, and the company's capital previously expended, a total of 614,000*l.* for the estimate of the work, or upwards of triple the original estimate, and this is allowing but a moderate sum for contingencies, which have heretofore been very heavy.

I have estimated the great descents at double Mr. Brunel's estimate, and yet, from the nature of the work, I have as much doubt as to the sufficiency of that sum as of any other item in my estimate.

If, however, in place of determining to complete the tunnel without reference to cost, which the foregoing observations suppose, the Lords of the Treasury resolve, as heretofore, to confine their operations to the advance of the tunnel, so as to remove any doubt of its getting through, before they sanction a further heavy outlay, then although I agree with Mr. Brunel that the pumping-well or the shaft with the drift-way or drain would lessen the springs, I do not by any means think them so essential to the progress of the work as to agree in recommending their being proceeded in at present. Up to the time of the second irruption, in January, 1828, the works were under the uncontrolled management of the directors and engineers, and during that period nothing had been done on the Middlesex side with a view of draining the water from the tunnelling, although it had been advanced to the middle of the river, only 155 feet having been done since; but in the report of 1831 the drift-way or adit is proposed and estimated, with the pumping-well, at 6,000*l.* Mr. Brunel informs me that the drainage in the tunnel is now very small, and the short time in which the water, after irruptions, has been taken out, proves that the present pumping-engine is fully equal to the work.

More rain by two inches fell during the last six months of 1836 than of 1835,* an increase, but not such as to cause a very important difference in the workings, which I ascribe almost entirely to the ground towards the Middlesex side being of a looser and more sandy and silty nature than towards the south side; this, it has always been said by the Trinity officers and others acquainted with that part of the river, would be found to be the case; so that, although the spring-water has been an evil and an hindrance, the Thames water has been another and probably a greater, and is the present enemy, which makes the cases of the London Dock or the Kilsby Tunnel parallel to a certain extent only. It is not in preventing the communication with the spring, but with the river water, that the artificial roof of clay, &c., has been useful.

I agree that the air for respiration would be improved by the drift-way, and probably the present air-pump, which is worked by the steam-engine, rendered unnecessary; but this pump, ingenious as all Mr. Brunel's applications are, appears completely to answer the purpose, and would probably be found quite as effectual in abstracting the sulphurated hydrogen as a drift-way at the bottom would be.

I cannot agree as to the saving of expense by the shorter distance to the Middlesex shaft; the difference of distance in the present situation of the shield would be only 70 yards, and as an excellent railway is laid, and machinery attached for working it by the steam-engine, I am sure that the conveyance of the excavated soil along the bottom of the tunnel to the low ground on the Surrey side must be at least as cheap as to the Middlesex side, where the ground is chiefly covered with buildings, and does not require to be raised; and that, as a passage to and from their work, the workmen would generally prefer the spacious lighted tunnel to a drift-way until the difference of distance is much greater than at present.

That the well or shaft on the Middlesex side would give employment to the miners and other workmen when they cannot be employed in the shield, and thus lessen the amount now charged to the tunnel, I entirely agree; but my opinion at the same time is that they may be fully employed in securing the ground in advance of the shield, according to Mr. Brunel's plan, or with the additional piling, such as I have suggested. It appears to me that sinking the shaft, driving a drift-way, making a new shield, and proceeding from the Middlesex side, would amount to a committal to go through with the undertaking, and ought not to be begun until that, as a previous question, has been determined.

In stating this, I am in some measure influenced by the opinion that Mr. Brunel's estimate for the works on the Middlesex side is too low. He estimates the pumping-well and drift-way at 7,000*l.*, and the shaft-engine and pumps at 6,844*l.*, and gives a decided preference to the shaft. Now, the shaft on the Surrey side is stated in the account to have cost 20,000*l.*, and evidently the drift-way, 4,310*l.*, should have been added to the shaft as to the well plan. The Middlesex shaft may, and probably will, be less expensive than the Surrey one was; I think it unsafe to trust calculation against experience, so far as to take one-third of the actual cost of the Surrey, as the estimate for the Middlesex shaft.

Of the propriety and importance of changing the channel for the passage

* The quantity of rain that fell in the last six months of 1835 (as kept at the Royal Society's Rooms) was 10½ inches, and in the corresponding period of 1836 it was 12½ inches. In the same period of 1834, a very dry year, it was only six inches.

of vessels, from the part of the river in front of the shield which has yet to be tunnelled through, over to the part which is tunnelled, and forming a body of compact gravel and clay in front of the shield, in the way Mr. Brunel proposes, to a greater thickness than is now compatible with navigation, there can be no question; and I am glad to learn, by a letter received from Mr. Charlier, that the Navigation Committee have agreed to the proposal; and as Mr. Brunel considers that this will remove much of the cause of the late irruption, by enabling him to have a better covering of clay, and preventing vessels grounding upon the artificial bed, and estimates the necessary work at only 1,800*l*., I have no hesitation in recommending to the Lords of the Treasury to sanction it, even with the addition I have proposed, should Mr. Brunel be disposed to adopt it. I think the expense of the piling and clay may be taken at about 10,000*l*., and I feel assured that, if the completing of the tunnelling be the object, this outlay will be more effectual, and much less in amount, than proceeding with the works on the Middlesex side; from the length of the river proposed to be covered with clay, if done according to Mr. Brunel's plan, being three times greater than with piling suggested by me, I think the difference of expense of the two plans would be small.

Having now given my opinion on the various points that have been referred to me, I would beg to add, that as the Thames Tunnel is Mr. Brunel's work as respects design and responsibility, any measure that may be proposed for executing the work should, in my judgment, have his approval. If that approval is refused, unless the Lords of the Treasury will consent to works which exceed the amount they have yet thought proper to agree to, almost any course would be better than letting the complaint be repeated, "that the engineer has been deprived of the proper means of completing the work at the estimated cost."

December, 1837. JAMES WALKER.

FRESCO PAINTING.

Our attention has been called to a very interesting course of lectures on fresco painting, by Mr. E. H. Latilla, now being delivered at the rooms of the Society for promoting Practical Design, Leicester Square. The object of this institution is to extend the application of the Fine Arts to the practical purposes of ordinary life; and there is no one object which is more worthy of this attention than internal decoration. It is indeed highly to be regretted that in a country which possesses so many fine works, architecture should be shorn of half its attractions. In most other countries, cathedrals and palaces shine with all the attractions of statues, and all the varieties of colour. Abroad, the architect may justly be proud of a profession which is considered worthy of the strongest support of all the sister arts. In Italy, the architect acquires the greater glory, by the powerful assistance of the sculptor and the painter. In the golden age of the arts, the proudest monuments of architecture were not considered finished till they were enriched with the works of Michael Angelo, Raffaelle, or Titian. Thus the finest productions of the great masters are known by their locality; they are not distinguished simply by their own titles, but as being in such an edifice. Artists laboured with the greater success, when they were animated by the consideration that their productions were not to be sent as beggars to seek their fortunes singly in the world, but that they had the power of erecting a large monument to their fame, and were assured of all the advantages of a noble edifice. It was this feeling that produced the Sistine Chapel and the Vatican; —and what have we in England to compare with these?

Now when a large public building is in contemplation, it is unfortunately too often the case that it is considered as a mere affair of stones—bricks and mortar—very little sculpture is thought of, and both fresco and oil painting totally neglected. The effect of this, is the production of a large raw mass to be smoked into softness; we go into a palace as into a desert, and into a church as into a cave of the sea; finding nothing to relieve the monotony of the walls, if the decoration that may be attempted do not increase it. This is disgraceful to us who have one of the finest schools of architecture in Europe, if not the best; while the French, and still more the Germans, are paying the greatest attention to this essential department. The King of Bavaria, especially in the Pinacotheca and Glyptotheca at Munich, has produced some of the noblest specimens of modern times. Those museums, decorated with appropriate paintings and emblems elucidatory of their objects, are undoubtedly the finest in Europe. There no one can mistake the character and designation of the edifice; for the moment that it is entered, every wall tells its story in the most natural language,—that of the descriptive arts. In England, on the contrary, whether you go into a palace, a senate-house, or a gaol, the same unmeaning nakedness leaves the visitor often uncertain which edifice he has entered. In Italy, neither palace nor church is left unadorned; every wall speaks to the eye equally with the whole building; and even down to the commonest houses, there are few which are not decorated in some manner more artistical than the nondescript paper hangings with which we supply their place.

Painting is such a general accompaniment of architecture, that it is indeed truly singular that ours should be the only school which has omitted its employment. It has been adopted by every style and every age; and its neglect has been reserved only for this country and the present day. The paintings in the temples and tombs of Egypt, remain to this day to show how that people could appreciate their advantage; they were aware how far this art could strengthen the character of an edifice and augment its impression. No people ever attained a better conception of what was solemn in architecture; and none, except the Gothic nations, availed themselves so much of its power on the minds of the multitude. In maintaining the impressiveness of a building, they never omitted the assistance to be derived from its decorations; and this union of all the powers of art must have rendered an Egyptian temple in perfection, a speaking monument to the multitudes who crowded to its worship. The grandeur of the edifice, the mysterious and gigantic forms of the colossal gods, and the variety of the colours dispersed every where, must have increased in effect from the subjects of the paintings. These frequently represented the simplest occupations of the peasant, and similar subjects with which the mass of the people could readily sympathise; from these objects the mind was rendered more susceptible of the grandeur of the scene around, and was softened by degrees to the impressions of awe and mystery, which were the characteristics of their worship. The numerous instances in which painting was recognised by the Greeks and Romans as an important adjunct in architecture, are too trite to allow of repetition. In the Baths of Titus, these latter left a torch to re-kindle the altar of art, for it is to them that we mainly owe the Loggie of Raffaelle, and the Mantuan works of Giulio Romano. In the Italian school down to the present day, this union has never ceased. In the Moresque and all the Oriental, their mastery in this department has been complete; and they have by their admirable combinations of colour, produced that effect, of which by their religious scruples they were deprived, in the representation of the human form.

It is only at the present day in England, that this neglect has taken place; for from the earliest times, we possess testimonials of the manner in which our ancestors esteemed the union of painting and architecture. In the Saxon periods there are repeated records, and in the later styles we possess abundant existing evidence. It is the Gothic architects who have most availed themselves of an important and peculiar feature in their styles, the use of painted windows; while in Winchester Cathedral and many other buildings, we find the roofs painted, the walls covered with frescos, and even the very pavements decorated. It is unfortunate that this is not continued in the present edifices of those styles; for surely where religious scruples have been overcome as to coloured windows, none can exist with regard to painted ceilings. At a later period, the genius of Rubens was employed to decorate Whitehall Chapel with some of his finest works; as still later, Thornhill painted the dome of St. Paul's.

Were this union of all the arts attended to in architecture, it would undoubtedly tend to elevate the character of the profession. Every architect should possess some acquaintance with the other departments of the arts; and such knowledge could not fail to refine the mind, and direct the taste towards harmony and beauty. We have possessed men who have fully appreciated this; and in Sir John Soane's Museum we see an eminent instance, in the manner in which he recognised the mutual connexion of all departments of the arts.

There is now a better spirit abroad with respect to the arts; and the interest which they at present excite from patrons and connoisseurs, imperatively requires of the professional man an equal degree of attention. It is a great proof of sounder taste, that the vitiated styles of Louis Quatorze and Quinze are now on their decline; and we fully expect that the style of the *Renaissance* which is already fully established in France, will soon be in equal vigour here. Not that we consider the style of the *Renaissance* to be either pure or good *per se*,—but still, a style which exercised greater and earlier genius than that of the declining period of Louis Quatorze, must be hailed as an advance made in the career of the arts. There is no period which could be more auspicious than the present for the execution of works in fresco, as we now possess advantages which were denied to the artists of the fifteenth century. In the remains of Pompeii, and in the discoveries of three centuries, but particularly in those of the purest Greek works, we possess materials for study which were denied to Raphael and Paul Veronese, who had only the Baths of Titus; while we have not only all the assistance to be derived from these latter specimens, but in addition, the labours of the great masters who have studied from them.

We recommend those who feel interested in this subject to hear the rest of the course of lectures which are given by Mr. Latilla, an artist who has paid particular attention to this subject; and who in his efforts to extend it in this country, has been gratified by the patronage of the nobility, in many works which do equal honour to his skill and to their taste. At his first lecture among many other highly interesting illustrations, he exhibited some original specimens by Paul Veronese.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

REPORT OF PAPERS READ AND PROCEEDINGS, SESSION 1838.

(*Continued from page 259.*)

On the Limestone, the Lime Cement, and method of Blasting, in the neighbourhood of Plymouth. By W. Stuart, M. Inst. C. E.

Plymouth abounds in limestone, which may be raised in solid masses of from three to ten tons; it is used most extensively for building and for lime manure. About 13 cubic feet weigh a ton; the limestone is of a light blue or grey colour, in general free from metallic veins, but with some indications of manganese and iron-stone, round pieces of the latter being found in clay beds, intermixed with the rock, and a vein of ironstone four inches thick at the surface of the rock, and dipping towards the south, has been opened.

The author then proceeds to describe the general method of making cement in that neighbourhood, and the method which he has employed with considerable advantage.

The bit or iron rod, called a jumper, is generally used. In pitching a deep hole, a 2-inch bit is used for about four feet, and a 1¾ inch for the next four feet, by one man; then two men are employed with 1¾ inch to the depth of 14 feet, and 1½ inch to the depth of 21 feet. A constant supply of water is required during boring the hole. The hole being well dried, about one-third is filled with powder, say 15lb.; a needle is introduced as far as possible without driving it; the hole is tamped with dry clay to the top, and then covered with a little wet clay, to prevent any of the loose particles falling in when the needle is withdrawn. A reed, filled with powder and split at the top, to prevent its falling to the bottom of the hole, is inserted, and a stone laid upon it; the powder being ignited by a piece of touch-paper and a train, the reed flies to the bottom of the hole, and ignites the main load. The rock is generally cracked and loosened to a considerable extent, if not thrown; in that case, the needle is driven through the tamping, and such a fresh charge is run through the needle-hole as may be requisite. From six to eight tons of rock are generally blasted with one cwt. of gunpowder. The paper is accompanied with drawings of the jumpers, the tamping bar, the needle, and the discharging reed.

Account of the Pont-Y-Tu Prydd, over the Taáf, Glamorganshire. By Thomas M. Smith.

In 1746, William Edwards undertook to build a bridge over the Taáf; the first, which consisted of three arches, was carried away by a flood; the second, of the same dimensions as the present, fell from the too great load on the haunches. Before commencing the work again, Edwards is said to have consulted Smeaton; and either from the advice of that distinguished man, or from his own experience, he left in each of the haunches three cylindrical openings, from face to face, and it is said that the intermediate spaces are filled up with charcoal. The bridge was finished in 1750. The arch measures 140 feet betwixt the abutments, and has a curved line of 35 feet. The width of the soffit is 15 feet 10 inches at the springing, and 11 feet 5 inches at the crown; the width of the roadway at the crown being 11 feet.

The preceding is accompanied with a beautiful drawing, exhibiting the elevation, plan, and section, of the bridge.

On some Operations in Blasting in the Jumna, and at Delhi. By George Tremenheere, Lieut. Bengal Engineers, Assoc. Inst. C.E.

In this paper, the author gives an account of the charges of powder, and the mode of tamping in blasting under his direction, during the years 1828 and 1829, for improving the navigation of the Jumna, and from the years 1831 to 1835, at the fortifications of Delhi. The jumpers were 6 feet long, and 2½ inches in diameter; the blasts 5 feet deep, and at a distance of 4 feet from each other. The rate of boring varied from 2½ to 5 feet per day's work for two men. A double-headed jumper was used, to render the hole completely circular for the reception of the canister, about 2½ feet in length and 2 inches in diameter, and filled two thirds with powder and the rest with sand. The small tube reaching to the surface of the water contained quick-match, with a piece of slow match at the extremity. The canister, well greased, was placed in the hole without any additional tamping. The method of removing the masses, and the tools employed, are described and explained by drawings.

At Delhi, the blasting was in dry rock, and economy of gunpowder being of more importance than economy of time, tamping was resorted to. For this a stiff red clay, slightly moistened, was employed, and the tamping-bar was of wood, and the priming wire of copper. Any dampness which might exist in the bore was obviated by a tube of coarse paper, greased on the outside. Fine mealed powder was used as priming, and a piece of port fire for ignition. If the firing did not succeed, a fresh priming hole was bored in the tamping; or the mine abandoned. In large irregular masses of rock, the depth of the bore, or the intervals between the blasts, will generally represent the line of least resistance; and the following results were obtained in the rock at Delhi, which is hard quartz.

The line of least resistance not exceeding one foot, a charge of 2 oz. is sufficient; the line not exceeding 4 feet, and the rock not being highly crystaline, 3 oz. per foot will be sufficient.

The charges will vary with the tenacity of the rock, but the following may be a general guide:—the line of least resistance being 1, 2, 3, 4, 5, 6 feet, the charge will be 4, 8, 14, 20, 26, 36 ounces.

On comparing the charges used at Delhi, where stiff clay was used as tamping, with those in the Jumna where sand was used, the following table is the result:—

Line of least resistance.	With clay tamping.	With sand.
2 feet	8 oz.	26·8 oz.
2½	10	33·5
3	12	40·2
4	20	53·6

The charges in the last column are to those in the second as 3 to 1, nearly; they are not, however, given as the least required, but are those actually used.

The author is of opinion, that nowithstanding the increased expenditure of gunpowder when sand is used as a substitute for tamping, the saving of time and labour is such as may, under some circumstances, counterbalance that disadvantage. This is stated to have occurred on the Jumna, where, owing to the rise of the river during the periodical rains, it was required to execute the greatest possible quantity of work with large bodies of men in a given time.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At an Ordinary General Meeting of the Members, held on Wednesday the 23rd of July, 1838,

EARL DE GREY, President, *in the Chair,*

Letters were read from Chevalier Gasse of Naples, and Signor Ittar of Catania, Honorary and Corresponding Members.

The following donations were received:—J. G. Wilkinson, Honorary Member; copy of his work on the manners and customs of the ancient Egyptians, 3 vols. 8vo.—H. E. Kendall, Fellow; Designs of Inigo Jones, folio; Swan's designs, folio; Pozzo's Perspective, 2 vols.; Vedute di Livorno; Murphy's Travels in Portugal; Daviler's Architecture, 2 vols.; Danish Vitruvius, 2 vols.; Halfpenny's Architecture, 1 vol.; Arch of Septimus Severus, folio; Description de l'Hostel des Invalides, folio; Views of public buildings in Paris.—Baron Wettenstedt; L'Antichita di Roma di a Fulvio, 12mo.—J. H. Taylor, Fellow; Lithographed plan of the Westminster Improvements, as prepared by Messrs. Bardwell and Taylor.—G. B. Webb, Associate; Print of Arc de Triomphe de l'Etoile.—C. J. Richardson, Fellow; 1 vol. of private plates of the late Sir John Soane.—J. Blore, Associate; copy of his Lectures on Gothic Architecture.—W. D. Butler, Fellow; Lithographic drawing of principal front of Roman Catholic College, Kilkenny; and specimens of Irish marbles.

The Architectural Society have passed a resolution expressive of their opinion that the union of their body with the Royal Institute of British Architects would be beneficial to the profession; and have appointed a Committee to confer with the Council of this Institute. The Council have on their part named a Committee of Conference, who have met; and there is every hope that a satisfactory adjustment may accomplish an union which is on so many accounts desirable. Of course a special general meeting of the members of the Institute will be convened to receive the Report of the Council on the matter.

The letters from the Rajah of Tanjore and Col. McLean, Resident, (see Journal X. p. 259) were read; and the Secretary explained the several drawings referred to, consisting of 11 illustrations of pagodas, temples, halls, and palace at Tanjore, Avidiar Coil, Cambaconam &c.; and also the plan of the Island of Sheevasamoodram, presented by Col. McLean.

Mr. Donaldson described the arrangement of a Turkish bath at Bergamo in Asia Minor.

Mr. Griffiths completed his course of papers on Chemistry as applied to construction, by describing the elementary principles of heating and ventilating in buildings.

His Lordship, the President, then concluded by an address to the meeting, enumerating the results of the session, and calling upon the Members to avail themselves of the opportunities afforded by the recess, for procuring information to lay before the Institute during the next session.

Resolved, that the most grateful thanks of the Institute are due to his Lordship for his attendance this evening, and for the advantages resulting to the body from his continued countenance and support.

Adjourned until after the recess.

ELECTRICAL SOCIETY.

At the ordinary meeting on Tuesday evening, the 3rd ult., a communication was read from Mr. Nayler, of Southsea, on the local attraction of iron built steam-vessels; "a property whereby the indications of the compass are made to depart from the truth, except when the ship's head is nearly North or South." The local attraction in ordinary vessels, and the mode adopted for its correction, were described. Mr. Nayler has no doubt that it will be found to follow the same laws in iron as in other vessels, only perhaps under an augmented form; but being once accurately ascertained in its quantity, all danger from its existence will cease, since every course steered can be corrected for it. He however earnestly advises the local attraction to be taken previously to the departure of an iron steamer, and also at the different ports she may reach; for the deviation is not a constant quantity.

LAW PROCEEDINGS.

COURT OF EXCHEQUER, *July 4th.*

LOSH *v.* HAGUE.

This was an action brought by Mr. Losh, an engineer residing near Durham, against Mr. Hague, a gentleman of the same business in London. The complaint made by Mr. Losh was, that, in the year 1837, the defendant infringed a patent obtained by the plaintiff for an improvement in the constuction of wheels for carriages, to be used on railroads. Proceedings having been instituted in the Court of Chancery, an injunction was obtained; for the purpose of sustaining which, and of taking the opinion of a judge and jury in a court of common law, the present action was brought. The defendant pleaded that he was not guilty of infringing the patent of the plaintiff, and that the improvement for which the plaintiff had obtained his patent, was a trifling and insignificant improvement upon the wheels formerly in use.

For the plaintiff evidence was given, showing that the wheels now made by the defendant were no improvement upon the patent of the plaintiff, but were precisely on the same principle, and as nearly as possible the same. The witnesses also stated, that, in 1830, the invention of the plaintiff had brought forward a principle never acted upon before, and one which had rendered the wheels constructed upon it remarkable for their safety and durability.

The evidence for the defendant, on the contrary, went to show that, as long ago as the year 1808, an improvement had been made by a man named Peyton; between which, and that now claimed by the plaintiff, scarcely the slightest difference existed.

Lord Abinger told the jury, that if any part of the wheel made according to the plaintiff's plan, in which part an improvement was stated by the plaintiff in his specification to have been introduced by him, was the same as that previously discovered by Peyton, they must find for the defendant.

The jury consulted for about a minute, and then gave their verdict for the defendant. This cause lasted the whole day. Among the witnesses examined for the plaintiff were, Mr. Nicholas Wood, Mr. Buddle, and Mr. Francis Bramah; and for the defendant, Mr. Roberts of Manchester, Mr. Braithwaite, Mr. Ericsson, &c.

COURT OF QUEEN'S BENCH. *July 6th.*

ROUGH *v.* THE GREAT WESTERN RAILWAY COMPANY.

The Attorney-General (with whom were Mr. Richards and another learned gentleman) as counsel for the plaintiff, said this was an action brought under the following circumstances:—Messrs. Houghton and Baxton, of whom the plaintiff was the assignee, were contractors, who had undertaken to perform a portion of the works on the Great Western Railway; namely, the formation of a number of shafts for a tunnel now being made, and commencing at the village of Box, about six miles from the city of Bath. Being thus employed, Houghton and Baxton were obliged to obtain the necessary machines for the performance of the contract, and they purchased tools and various materials to the value of nearly 4,000*l*. They, however, had the misfortune to become insolvent before this contract was completed. A commission of bankruptcy was issued against them, and the assignees immediately desired to have the machinery, tools, and materials that belonged to Houghton and Baxton, in order to share their value among the various creditors. Upon application to the company for this purpose, the directors would not deliver up the property, claiming it as their own, the contractors having forfeited it by the non-performance of the work agreed upon. The present action was therefore brought by the assignees of Messrs. Houghton and Baxton, to recover the value of the materials and machinery that had been unlawfully detained by the Great Western Railway Company.

Sir Wm. Follett (with whom was Mr. Talbot) appeared for the defendants. He contended that the company were justified in the course they had pursued, as they were entitled to retain the materials and machinery by the contract between themselves and Houghton and Baxton. By that contract it was agreed that in case the works were not proceeded with expeditiously and to the satisfaction of the company, a notice should be served upon the contractors to inform them of it, and to require them to proceed with greater expedition. If that notice was not complied with in less than seven days, the company were empowered to engage other workmen. By another clause of the contract it was arranged, that in case Houghton and Baxton became defaulters, the company might detain the materials and use them until the works were completed. Upon these grounds the learned counsel said he trusted the jury would return a verdict for his clients, and thereby compel the fulfilment of the contract into which Houghton and Baxton had entered with the company.

Evidence having been called, and the Attorney-General having replied,

Lord Denman summed up, and in so doing said that if the jury were of opinion that the company were not justified in detaining the property, their verdict must be for the plaintiff. If, on the other hand, they thought that the contract entitled the Great Western Railway Company to act as they had done, they would of course find in favour of the defendants.

The jury returned as their opinion that the work was suspended sufficiently by the contractors to justify the notice given; and that, upon the notice, the contractors did not comply with it.

Lord Denman: Then I will direct the verdict to be for the plaintiff generally, with liberty to the defendants to move.

PARTY-WALL CASE.

On Tuesday, 17th July, Mr. Thompson, architect, accompanied by Mr. Foxhall the District Surveyor, applied to the sitting magistrates of Great Marlborough-street Police-office, under the following circumstances. That having given three months' notice of an intention to survey the party-wall between the premises, Nos. 111 and 112, New Bond-street, and having been met by two other surveyors (Mr. Henry R. Abraham and Mr. Alfred Beaumont), pursuant to the 38th section of the Building Act, and not having come to any conclusion within the time specified in the Act, they the applicants on behalf of the party giving the notice, require the magistrate to appoint one other, that is a fifth surveyor, to meet and determine the matter.

Sir F. Conant was about to appoint, and named Mr. Cantwell; Mr. Foxhall said that he rejoiced at that gentleman being named, because he was sure he would have the wall down. Upon this Mr. Abraham interposed, and stated that under such circumstances he should object to any appointment whatever. He then pointed out an informality in the notice, which was laid under the 38th section, relating solely to state and condition, whereas it should have been given under the 39th section which refers to thickness. Mr. Foxhall and Mr. Thompson contended, that the word condition comprehended both repair and sufficiency of thickness. Mr. Abraham replied, and Sir F. Conant after a patient hearing of rather a warm discussion, decided that as the clauses were distinct and explicit in their separate uses, the alleged informality was fatal, and he should decline naming a fifth surveyor. Three months' further notice must therefore be given by the applicant.

PARLIAMENTARY PROCEEDINGS.

House of Commons.—List of Petitions for Private Bills, and progress therein.

Those marked thus — are either withdrawn or rejected.

	Petition presented	Bill read first time.	Bill read second time.	Bill read third time.	Royal Assent.
Aberbrothwick Harbour	Feb. 12.	—	—	—	—
Anti Dry-rot Company	Dec. 7.	Feb. 26.	—	—	—
Ardrossan Railway	Feb. 16.	—	—	—	—
Belfast Waterworks	Dec. 21.	Apr. 6.	..	..	..
Birmingham Equitable Gas	Feb. 16.	Mar. 2.	—	—	—
Birmingham, Bristol, and Thames Junction Railway	Feb. 16.	Mar. 26.	May 15.	..	..
Birmingham and Derby Junction Railway	May 7.	May 25.	June 6.	June 27.	..
Blackburn Gas	Feb. 14.	Mar. 8.	Mar. 22.	May 10.	July 4.
Bolton and Preston Railway	Feb. 15.	Mar. 14.	April 30.	May 23.	July 4.
Boughrood (Wye) Bridge	Feb. 11.	Mar. 26.	April 27.	May 21.	June 11.
Brandling Junction Railway	Jan. 16.	Feb. 14.	Mar. 20.	Apr. 25.	June 11.
Bristol and Exeter Railway	Feb. 12.	Mar. 21.	Apr. 3.	May 9.	June 11.
Bury (Lancaster) Waterworks	Feb. 13.	Mar. 15.	Mar. 30.	May 21.	June 11.
Bude Harbour	Mar. 30.	..	..	..	..
Cheltenham and Great Western Union Railway	Dec. 15.	Feb. 20.	Feb. 27.	Mar. 28.	June 11.
Cookham Bridge	Feb. 15.	Mar. 8.	Mar. 20.	Apr. 25.	..
Deal Pier	Feb. 16.	Mar. 26.	..	May 18.	June 11.
Eastern Counties Railway	Jan. 25.	Feb. 26.	June 1.	June 27.	..
Edinburgh and Glasgow Railway	Jan 25.	Mar. 2.	Mar. 18.	May 7.	July 4.
Exeter Commercial Gas	Feb. 16.	Mar. 26.	April 27.	May 21.	July 4.
Farringdon (London) Street	Feb. 5.	Mar. 26.	April 27.	June 15.	..
Fen Drayton (Cambridge) Enclosure	Feb. 11.	—	—	—	—
Fishguard Harbour	Feb. 9.	Feb. 23.	Mar. 12.	May 8.	..
Fleetwood Tontine	Feb. 15.	Mar. 26.	..	..	..
Garnkirk and Glasgow Railway	Feb. 13.	Mar. 26.	Apr. 25.	June 21.	July 4.
Glasgow Waterworks	Feb 2.	Feb. 26.	Mar. 16.	June 11.	..
Grand Junction Railway	Feb. 12.	Mar. 8.	Mar. 29.	June 8.	July 4.
Gravesend Cemetery	Feb. 14.	Mar. 21.	Apr. 8.	April 30.	June 11.
Gravesend (No. 1) Pier	Jan. 25.	Feb. 7.	Feb. 26.	..	..
Gravesend (No. 2) Pier	Feb. 16.	Mar. 26.	..	..	..
Great Central Irish Railway	Feb. 26.	Apr. 3.	..	..	..
Hartlepool Dock and Railway	Feb. 16.	Mar. 26.	May 8.	July 11.	..
Herne Gas	Feb. 16.	Mar. 26	..	..	..
Isle of Thanet Cemetery	Feb. 14.	Mar. 26.	May 31	June 21.	..
Lady Kirk and Norham (Tweed) Bridge	Feb. 16.	Mar. 26.	..	..	July 4.
Leamington Priors Gas	Feb. 16.	Mar. 26.	April 26.	June 11.	July 4.
Leicester Gas	Feb. 16.	Mar. 26.	April 30.	May 31.	July 4.
London and Croydon (No. 1) Railway	Dec. 22.	Feb. 23.	Mar. 7.	April 4.	June 11.
London and Croydon (No. 2) Railway	Dec. 22.	—	—	—	—
London and Greenwich Railway	Dec 11.	Feb. 7.	Feb. 20.	Mar. 21	Apr. 11.
London Grand Junction Railway	Feb. 15.	Mar. 26.	April 26.	—	—
Londonderry Bridge	Nov. 27.	Mar. 5.	April 30.	..	June 11.
Manchester, Bolton, and Bury Canal, &c.	Jan. 23.	Feb. 19.	Mar. 8.	May 3.	June 11.
Metropolitan Suspension Bridge	Feb. 16.	Mar. 26.	May 8.	June 15.	July 4.
Midland Counties (Mountsorrel) Railway	Feb. 8.	Mar. 16.	Mar. 29.	May 23.	July 4.
Montgomeryshire Western Branch Canal	Jan. 16	Feb. 27.	—	—	-
Moy River (Ireland) Navigation	Feb. 13.	—	—	—	—
Necropolis Cemetery	Dec. 14.	Feb. 12	Feb. 26.	..	..
Newcastle-upon-Tyne Railway	Dec. 1.	Feb. 9.	Mar. 6.	May 3.	June 11.
Newcastle-upon-Tyne and North Shields Railway	Feb. 14.	—	—	—	—
Newquay (Cornwall) Harbour	Feb. 13.	Mar. 26.	May 3.	May 28.	.
Newtyle and Cupar Angus Railway	Feb. 13.	Mar. 26.	April 25.	June 21.	July 4.
Oldham Gas and Waterworks	Feb. 13.	Mar. 8.	April 2.	July 4.	..
Oxford and Great Western Union Railway	Feb. 16.	Mar. 7.	Mar. 14.	June 8.	..
Paington Harbour	Dec. 7.	Dec. 22.	Jan. 16	Feb. 28.	Mar. 30.
Portland Cemetery	Feb. 16.	—	—	—	—
Portsmouth Floating Bridge	Feb. 15.	Mar. 8.	Mar. 26.	April 27.	..
Rocester Bridge	Feb. 14.	Mar. 19.	April 3.	May 21.	July 4.
Royal Exchange	May 25.	June 11.	June 21.	July 16.	..
St. Helen's and Runcorn Gap Railway	Feb. 15.	Mar. 16.	Mar. 30.	April 27.	June 11.
St. Philip (Bristol) Bridge	Feb. 16.	Mar. 26.	May 10.	May 31.	July 4.
Saltash Floating Bridge	Dec. 21.	—	—	—	—
Soane's Museum	Feb. 12.	—	—	—	—
Southampton Docks	Feb. 14.	Mar. 29.	May 7.	June 1.	July 4.
Southampton Pier	Feb. 9.	Mar. 26.	May 4.	June 6.	July 4.
Taw Vale (Devon) Railway and Dock	Feb. 15.	Mar. 12.	Mar. 26.	May 3.	June 11.
Tenby Improvement and Harbour	Jan. 28.	Feb. 9.	Feb. 26.	Apr. 8.	..
Thames Improvement Company and Drainage Manure Association	Dec. 4.	Feb. 16.	..	..	..
Thames Purifying Company	Feb. 16.	—	—	—	—
Turton and Entwisle Reservoir	Feb. 18.	Mar. 8.	Mar. 21.	May 8.	June 11.
Tyne Dock	Feb. 16.	—	—	—	—
West Durham Railway	Feb. 16.	—	—	—	—
West India Docks	Feb. 18.	Mar. 28.	Apr. 9.	April 30.	..
Westminster Improvement	..	June 26.	—	—	—

STEAM NAVIGATION.

Great Western Steam-Ship.—Bristol, July 8, Half-past Five o'clock, P.M.—The Great Western steam-ship, Captain Hoskin, R. N., commander, cast anchor this afternoon in Kingsroad, at about half-past two o'clock, having performed the home ward passage in the wonderfully short space of twelve and a half days. The outward-bound voyage was accomplished by this splendid vessel in fourteen and a half days, having sailed from Bristol, June 2d, and reached New York, June 17th, at four A.M.; which place she left for Bristol, June 25th, at five P. M. Thus she has performed the whole voyage from Bristol to New York, and back again, in the unparalleled short space of thirty-six days, eight of which were spent at New York, which leaves her four weeks for the actual voyage, which generally averages as many months by sailing vessels. The Great Western has brought over ninety-two passengers, all of whom express themselves in terms of the greatest delight and satisfaction with the splendour and comfort of her accommodations, and seem quite enraptured in making mention of the very slight motion felt on board the vessel throughout the passage, even when blowing hard; and during the latter part of the voyage they encountered heavy weather, which gave them every opportunity of judging of the great advantages possessed by the vessel in this respect. A passenger, with whom I had an opportunity of conversing, told me that he had several times crossed the Atlantic in sailing-packets, and in very similar weather to that experienced on his voyage home in the Great Western, and that he should not have believed it possible for such a difference to exist, had he not felt and tested it himself. Even in the roughest weather it seems that passengers may sit down to dinner without any of the fears or dangers of accident on board sailing vessels. You feel assured that you will not be laid sprawling on the cabin floor by your chair lurching to leeward, nor thought desirous of appropriating to yourself more than your share of eatables by getting the contents of half-a-dozen or more dishes poured wholesale into your lap. None of these or others somewhat similar, but even more disagreeable accidents, so frequent but unavoidable on ship-board, *are here felt; in fact, you may sit down and enjoy yourself almost in as much* ease as in a drawing-room on shore. This comparative tranquillity and slightness of motion is mainly to be attributed to her great length, which enables her to cut through several waves, into the troughs of which shorter vessels must of necessity roll, and become, as it were, "swallowed up." Vessels of great length must, therefore, of course, by reason of their powers, not only be much easier, but must also save very considerably in the time and distance occupied by vessels of ordinary length in rising and falling from the troughs of these seas. The Sirius reached New York on the 18th of June, at four o'clock P. M.; the Great Western having arrived the day previous at four o'clock A. M. The Great Western passed Sandy Hook at seven P. M. of the 25th of June, and from this time to the time of seeing Trevose Head, in Cornwall, was exactly twelve days. The average distance run on the outward voyage was about nine miles per hour, and on the homeward voyage rather more than ten miles per hour.—*Standard.*

STATEMENT OF THE GREAT WESTERN'S SECOND OUTWARD VOYAGE.

Date.	Sails set.	Winds.	Course.	Distance steamed	Average number of strokes of the Engine.	Pressure.	Vacuum in Condenser.
June 3	None	W., strong ..	S. 82 W.	164	11	3	29
June 4	Fore sail and fore-top sail, and fore and aft sails	N.E. mod.....	— 80 —	232	12	3¼	29¼
June 5	Mostly none..	N.E., calm ..	— 89 —	260	12	3¼	30
June 6	Same as 4th ..	S.W., mod. ..	— 75 —	250	12	3	29½
June 7	Fore and aft sails	S.W., fresh ..	— 80 —	242	12½	3	29¼
June 8	None	S.W., very do.	— 78 —	184	10	2½	30
June 9	Same as 4th ..	N.N.E., mod.	— 70 —	207	12	3	30
June 10	None	calm	— 71 —	246	14	3¼	29¼
June 11	None	W., fresh	— 72 —	199	11	3¼	29¼
June 12	None	W., ditto	— 79 —	208	11¼	3¼	29¼
June 13	None	W., very fair..	— 80 —	187	13	2¼	30
June 14	None	W., fresh	— 77 —	181	14¼	3¼	29¼
June 15	A.M. same as the 4th; P.M. none	N., moderate.	— 80 —	218	15	3¼	29¼
June 16	Same as 4th ..	W., ditto	— 87 —	227	16	3¼	

At 7 45 P.M., June 16th received a pilot on board; at day-light, 17th, made Neversink highland, crossed the bar at half-past four, and at the wharf at three quarters past six. Number of strokes of the engine, 276,215.

The British Queen.—This stupendous steam-ship, commanded by Captain Roberts, formerly of the Sirius, arrived at Port Glasgow on Saturday the 14th ult., and went into dock, where she is to receive her machinery. The Queen left Gravesend on Monday week, the 9th, and was towed to Plymouth by the Vulture steamer. Betwixt these places she had foul winds. At Plymouth the Vulture left, and the Queen then came right round by the Land's End herself in fine style, carrying all sail, and beating every vessel in her way, especially a French brig, which attempted to compete with her for some time. Having arrived at the tail of the bank early on Saturday morning, she was towed into the wet dock at eleven by the Samson steamer, the top of whose funnel, it was observed, just reached the top of the Queen's paddle-box.

The Bristol and American Steam Navigation Company have contracted for the immediate building of three large and splendid steam-ships to run between Cork and New York, in conjunction with the British Queen; they are to be christened President, Great Britain, and United States. The keel of the President has been already laid; she is to measure 2,028 tons.

An American Steamer crossing the Atlantic.—The Richard Anderson, Lucas, which left Charleston on May 27th, reports that on June 8th, in lat. 46 long. 30, she passed the City of Kingston steamer, from Baltimore for London, under canvass.—[The steamers which start from the United States do not seem to make very flourishing passages, when they let sailing vessels pass them on the way. It is something like the old story of the Stockport stages, which pedestrian travellers would not patronize, because they were in a hurry.]—*Manchester Guardian.*

The Royal William.—This vessel adventured an experimental trip in the Mersey on Tuesday, the 3rd ult., in order to test the efficiency of the alterations which, since it had been determined she should cross the Atlantic, have been devised and adopted. The result of this trial was eminently successful. In order to diminish the mass of coal which it had been calculated the furnace would consume, it had been contrived that a certain portion of turf should be mixed with the fuel, an expedient which it was imagined would not merely diminish the amount of dead weight, but would communicate heat to the boilers in a shorter space of time than would be occupied were the fuel to consist of an unadulterated quantity of coals. It has been ascertained, by careful and minute examination, that the admixture of turf will enable the Royal William to accomplish a voyage exceeding by one thousand miles the distance between New York and Liverpool. Another incident which occurred in the course of this experimental trip, affords a gratifying indication of the progressive improvements in steam navigation. During two hours, two only of the three boilers of the packet were used, and yet the speed of the vessel was not diminished. In the event of accident therefore, it will be an easy matter to repair damage without interrupting the average rate of progress of the vessel. This packet, it may confidently be predicted, sets forth on her trip more completely equipped to encounter the chances and obstructions which she is to brave, and better qualified by her surpassing capabilities to narrow the space which separates the States from Great Britain than any of her competitors.—*Liverpool Paper.*

The Royal William (steamer), for New York, with 40 passengers, left the George's Pier Head at six o'clock this evening, being the first steamer that has left the second commercial port in the kingdom. She was accompanied by several other steamers belonging to this port, which were crowded with spectators of all denominations.—*Liverpool, July 5.*

The New Steamer, Tiger.—This steamer belonging to the St. George Company, made her first experimental trip on Thursday, June 14; and seldom have we witnessed a more gratifying proof of the ingenuity of man than this gallant vessel presented. Her form is perfect symmetry, and nobly does she walk the water. She is one of the largest class, her size preventing her admission into any of the Liverpool docks. She is propelled by engines of 300 horse power, with expansive valves; and is fitted up with Mr. Samuel Hall's patent condensers. They are from the manufactory of Mr. Edward Bury, of this town; and in beauty of structure, combined with strength and durability, challenge competition: we recommend any person desirous to see first-rate machinery to visit the Tiger. The bed plates and condensers (cast in one piece) are a curiosity, and, we are informed, are of the enormous weight of 16 tons 8 cwt. and 16 tons 6 cwt. respectively. Her speed is very great, and from her performance on the first trial it is believed that she will surpass, in this respect, any vessel out of the port. We congratulate her spirited company on the acquisition of such a boat; and if, as we have heard, they intend despatching her to New York, we have no doubt that her passage will be performed in less time than it has yet been accomplished in. Go where she may, she will reflect credit on all parties concerned; and—success attend her, say we.—*Liverpool Chronicle.*

The Liverpool.—This magnificent steam-vessel, the property of Sir John Tobin, which has been lying for some months in the Trafalgar Dock, has begun to get her machinery on board. The dock trustees, in order to facilitate the operation, have erected cranes, &c., on the quay; and, the machinery being nearly all ready, she will be equipped for sea in the course of September next. Should Sir John not, in the meantime, dispose of her, it is highly probable that, should the prospects of transatlantic steam navigation become promising, the Liverpool will make her first trip to New York.—*Liverpool Mail.*

Steam Navigation to New York.—An incident showing the importance to Liverpool of a direct intercourse by steam vessels to New York, occurred last week, which strongly illustrates what we have before urged—namely, that the establishment of a line of steam vessels, taking their departure from Liverpool with the same regularity and punctuality which hitherto have distinguished the sailing packets, will make it the leading point for arrivals and departures, not merely for England but for the continent of Europe. On the advertisement of the sailing of the Royal William, for New York, on the 5th of July, being advertised in the London papers, several applications were forwarded from Paris, engaging berths in that vessel, and transmitting the amount of the passage money, the parties undertaking to be in Liverpool in time for the Royal William's departure. The railroad from London to Liverpool aids in no small degree that expedition and certainty which are essential to travellers. The proposal to insure the Royal William to and from New York for 20,000*l.*, one-half in London and the other in Liverpool, was taken, and the list filled at the underwriters' rooms in two hours from the time the risk was put on the books.—*Liverpool Mercury.*

The Sirius.—This fine steam-ship which is now on her second voyage to New York, is intended to be established as a packet between London and St. Petersburgh. She will leave London on the 1st of August on her first voyage. This will be a great accommodation for persons intending to visit the Russian capital; and we have no doubt the shortness of the passage will induce many travellers to go to that country who never before thought of such an excursion.

Liverpool and Brazil.—The second vessel for the line of steam-packets on the coast of Brazil, was launched on the 10th ult., by Messrs. Humble and Milcrest; she is called the Bahiana, from the port of Bahia, being the first at which the packets are to touch after leaving Rio de Janeiro. The Bahiana will proceed in a few days to join the St. Sebastian, at Hawarden, on the River Dee, to take her engines on board. —*Liverpool Paper.*

Steam Navigation on Canals or on the Severn.—The Manchester Guardian gives an interesting account of the performances of a small iron steam-boat, called the Jack Sharp, belonging to the Mersey and Irwell Navigation Company. She is about 65 feet long, 13 or 14 feet broad, and propelled by a common marine steam engine of twelve horses' power; the paddles are also of the common kind, but placed at the stern of the vessel, one on each side of the rudder; the chimney is far forward, and the engine above the paddles, which are connected with it by spur wheels. The boat draws about two feet eleven inches water without passengers, and when full (she has carried 120 persons) she draws about four feet water. The fuel used is coal; and it is stated that, although her power is twelve horses, she does not work more than seven. The vessel has no mast or sail, so that her performance is all steaming. She has a cabin, but most persons remain on deck. The engine projecting above the level of the main deck, its cover forms a sort of quarter-deck for the captain and the man at the helm. We understand her average performance during the week has been at the rate of 7 miles per hour. Her Captain states *that she does not cause the washing away of the banks, even to the same degree as the packets now plying on the river drawn by two horses.* The boat and engine were constructed by Mr. Jones, of St. Helen's. Could not such a vessel be introduced with advantage during a large portion of the year between this city and Worcester; and also on the Berkeley Canal, provided that steam navigation was extended from hence to Bristol? It seems most extraordinary that whilst there is scarcely a river in the kingdom suited for the purposes of navigation, on which steam has not been most successfully introduced, up to

the present moment, with one exception some years since, it should be unknown on the Severn. We have received more than one communication on the subject, particularly with reference to a steam communication between this city and Bristol. Such a steamer as that described above, fitted with patent paddles which make no backwater, would, we are persuaded, overcome any existing difficulty. The subject is worth attention. We perceive from our Hampshire contemporaries that a steam communication, which has just been established by a London company between Poole and Southampton, has been attended with astonishing success. We mention the fact to show what may be done in other neglected localities.—*Gloucestershire Chronicle.*

Iron Steam Packet.—On Saturday, June 23, an elegant wrought-iron steam packet, belonging to the Eagle Company, was launched from the Iron Steam-boat Building Establishment of Messrs. Ditchborn, More, and Co., next to the Victualling-office, Deptford. A numerous company was assembled, and she went off amid shouts, clapping of hands, and rejoicing. Of the superior speed, safety, and accommodation of this boat, there can be no doubt; nor of her amply remunerating the spirited owners who are the first to place a perfect iron steam packet for a regular passage trade on the River Thames. She was originally intended to ply with two others of the Company's boats between London-bridge and Woolwich, calling at Blackwall; but the Directors have since found it necessary to extend their line from Waterloo-bridge to Gravesend, still touching at Blackwall. The engines are by Miller, Ravenhill, and Co. The hull of this vessel being built entirely of wrought-iron, excludes the possibility of danger by fire; and being divided into three compartments by perfectly water-tight iron bulkheads, is equally secure from sinking.—*Sun.*

Iron Boat Worked by Ericsson's Propellers.—An iron vessel, constructed at the building-yard of Mr. John Laird, at North Birkenhead, called the Robert F. Stockton, fitted with Ericsson's propellers, and intended as a tow-boat on the Delaware and Raritan Canal, in the United States, was launched on Saturday the 8th ult. All her machinery, with the exception of the boiler, which will be ready in a few days, was on board at the time. She will be schooner-rigged; and, as soon as she is fully equipped, it is the intention of Mr. Ogden, the United States' Consul at this port, under whose inspection she has been built, to try her on the Mersey. From the experiments which have been made with the twin-boat, the Francis B. Ogden, on the Thames, sanguine hopes are entertained that the propellers, worked by steam, will give the boat an average speed of six or seven miles an hour; and should they be found applicable to sailing vessels, they will produce an important revolution in ocean navigation.—*Liverpool Mail.*

The French Steamer of War Meteor is lying in the river Thames, off the Tower, and is a fine craft. She is painted black, with brass tompions in her guns; her crew are short healthy-looking lads, but her marine artillerymen are fit for grenadiers. Visitors are received by the gallant officers with the greatest urbanity.—*United Service Gazette, July 2.*

A direct intercourse by steam has been lately established from Dublin to Paris; the distance is accomplished in about 45 hours.—A direct steam communication is about to commence between the Thames and the Shannon—London and Limerick.

Enormous Plate of Iron.—We were lately shown in Messrs. Fawcett, Preston, and Co.'s yard, two plates of iron, which are said to be the *largest ever made.* They measure 10 feet 7 inches long, 5 feet 1 inch wide, and 7-16ths of an inch thick, and weigh between 7 and 8 cwt. They are intended for the bottom plates of two steam generators on Mr. Howard's plan, and were made by the (Colebrook-dale Iron Company, Shropshire; who, we were informed, are the only company in Britain (we may say in the world) that can make plates of this size, or even approaching to it.—*Liverpool Standard.*

PROGRESS OF RAILWAYS.

Hull and Selby Railway.—We are glad to be enabled to inform our readers that the works on the foreshore, near this town, in connexion with the railway, have been in progress during the last three weeks, and every exertion will be used in order to complete the embankment in the course of the present summer. We are informed that several hundred men are employed on other portions of the line; and that the works of the Hessle contract especially will be carried on both day and night during the summer. An advertisement appears in our paper to-day for tenders for the erection of the bridge over the Derwent, and for the two remaining portions of the line which have not yet been contracted for, viz., from Melton to the Eastern extremity of the Market Weighton embankment, and from the River Derwent to the junction with the Leeds and Selby Railway at Selby. In a short time therefore the whole of the works will be in progress from one end of the line to the other. The directors have contracted for 1,500 tons of iron rails, in addition to previous contracts to the extent of 2,000 tons, making 3,500 tons in the whole. They have also agreed for six locomotive engines, and for all the land required between Hull and Selby, a considerable portion of which is paid for, and conveyed to the company. Of the third call of 5*l.* per share lately made, upwards of four-fifths have been received; and there is every reason to expect that this important line of railway will be opened early in the spring of 1840, agreeably to the intentions of the directors, to the great benefit of the town, the districts through which it passes, and with which it will communicate.—*Hull Advertiser.*

Opening of the Newcastle and Carlisle Railway.—The Berwick and Kelso Warder gives a long account of the opening of the whole line of railway from Newcastle to Carlisle, a distance of sixty miles, on Monday, June 25; and remarks, that although many of its readers may have no immediate connexion with either of these places, they can yet scarcely avoid being interested, more or less, in an event which consummates so signal an achievement of enterprise and scientific skill; and by effecting so rapid and easy a means of communication, not merely between two large and important towns, which may be regarded as the capitals of their respective districts, but between two extremities of the island—the German Ocean being on one side, and the Solway Firth on the other—affords so favourable an opportunity of extending the commerce of the whole North of England and South of Scotland, and thereby acting directly and most beneficially on its agriculture likewise.

Maryport and Carlisle Railway.—A meeting of the Directors was held at Aspatria, on Wednesday the 20th ult., to receive the report of Mr. Hall, the superintendent engineer, as to the progress of the work; every part of which is proceeding in the most satisfactory manner, as much so as the company could possibly expect or wish for. The numbers of men are increased as fast as the nature of the work will admit of: at present about 250 are employed; and it is satisfactory to state, that no impediments or difficulties have hitherto occurred, but every part of the undertaking is progressing with the greatest spirit and good feeling. The diversion of the river near Nether Hall is almost completed, and various other smaller diversions are in a forward state. The mason-work of some of the principal culverts is completed, and the stone-work for the largest bridges is in a state of great forwardness. It is unnecessary to state, that Mr. Hall's report was highly gratifying to the Directors; and, altogether, the prospects of this Company are flattering in the extreme.—*Whitehaven Herald.*

Morecambe Bay Railway.—Mr. Hague has arrived at the seat of his labours, and he is now busily engaged, with able assistants, in determining the points at which the railway ought to cross the Lancaster Sands, and in ascertaining the nature of the substratum. It is rumoured that Mr. Rastrick will be associated with Mr. Hague in a survey of the entire line.

Great North of England Railway.—The contractors for the railway bridge which is to cross the river Ouse at Poppleton, near York, have commenced operations upon the works; the navigators and carpenters are actively employed in excavating, &c., for the foundations. We understand that a temporary bridge will be thrown across the river, preparatory to their proceeding with the stone structure which is contracted for.—*Hull Advertiser.*

Lancaster and Preston Railway.—On Thursday June 28th, the day of the coronation, the first stone of the viaduct at Galgate, on the line of this railway, was laid by Mr. Alfred Jee, the resident engineer; the contractors and many others being present. A number of Victoria medals, kindly presented by some gentlemen of the neighbourhood, were deposited underneath the stone. This viaduct, which crosses the River Condor and the road at Galgate, will be one of the largest works on the line, and is to consist of six arches, each thirty feet span, and between forty and fifty feet high. It is to be built entirely of stone. The other works at this end of the line are proceeding with great activity; and a commencement has also been made near Preston.—*Lancaster Guardian.*

Manchester, Bolton, and Bury Railway.—We have great pleasure in stating that the traffic on this line of railway, which was opened some weeks ago, is rapidly increasing. The average number of passengers conveyed is about 1,200 a day,—a greater number than had been previously calculated on as likely to travel upon it. The stage-coaches which used to run between Manchester and Bolton are nearly all discontinued, the proprietors finding it a losing concern to compete with the railway. The applications to the company to carry goods are numerous; and there cannot be a doubt that, as soon as the arrangements are completed, the quantity of produce and manufactures conveyed along the line will be greater than the estimates formed by the projectors of the railway.—*Preston Observer.*

Leeds and Manchester Railway.—The works in this neighbourhood have been contracted for, and will, we understand, be commenced immediately.—*Halifax Express.*

A railway from Stockport to Macclesfield is to be immediately commenced; and it is expected that a line of railway from Manchester to Stockport will be simultaneously laid down.—*Liverpool Journal.*

Midland Counties' Railway.—The following is the engineer's return of the number of men and horses employed on the works of the Midland Counties' Railway, on the 30th of June, and of the quantity of earthwork excavated from the 5th to the 30th of June:—4,038 men; 385 horses; and 213,933 cubic yards of earthwork.

Birmingham and Derby Junction Railway.—The works on this line are advancing very rapidly, and the contractors are bound under heavy penalties to have the railway completed and open to the public, by the 30th of June next. A general meeting of the proprietors was held on the 3rd ult., at Dee's Royal Hotel, Birmingham, when consent was given to the new bill, which has passed the House of Commons, and is now before the Lords, to alter the line of this railway between Coleshill and Stonebridge, and which is being obtained at the expense of the Earl of Aylesford. The new line will leave the present one on the Coleshill side of Great Packington, and proceed through the parishes of Little Packington, and Bickenhill, and join the London and Birmingham Railway one mile nearer to the latter town than the line proposed to be abandoned. The new line is a quarter of a mile longer than the old one; but the levels are much better, and there will be a saving to the company of at least 6,000*l.*—*Daily Paper.*

London and Birmingham Railway.—It is reported that the 10th of September is the day fixed for opening the whole of the railway line.

Aylesbury Railway.—We observe from a circular lately addressed by the Chairman of the Directors to the Shareholders, that the whole of the land required for the railway has been purchased at prices within the sum originally estimated; and that the contract for making the railway has been let to Mr. J. R. Chapman, one of the most experienced contractors on the London and Birmingham line, at a sum below the engineer's estimate, under a penalty to complete the same by November next. It appears, by the report of the resident engineer, that he is advancing in his works with great rapidity—that about one-third part of the earthwork of the whole line is completed, and that the brickwork is also in great forwardness, and the embankment is made up at the point of junction with the London line.

The London and Southampton Railway, it is reported, will be open on the 1st of September next, as far as the great western road leading to Exeter, and the Southampton end as far as Winchester—making in the whole 53 miles of this great undertaking completed.

Newtyle and Glammis Railway.—This railway was opened on Monday, June 4, for the conveyance of passengers. The coaches run four times a week; and, as on the Coupar Angus line, the hours are made to suit those of the Newtyle Railway. The railway brings a district within its range, travelling from or to which has always been difficult; and we anticipate that it will soon supersede other conveyances to Kirriemuir and the other populous places in the district.—*Perthshire Courier.*

Glasgow, Paisley, and Ayr Railway.—The works are commenced on the whole line, except a portion between Paisley and Dalry, which will, however, be the next contracted for. It is expected that the joint line from Glasgow to Paisley, made at the expense of this company and the Greenock, in equal portions, will be ready to open next summer. A report was circulated at Liverpool, originating in a misinterpretation of a passage in the report of the Greenock Directors to their shareholders on the 2nd instant, that the Ayrshire Directors contemplated adopting a gauge of 5 ft. 0 in. for the rails. This point may be now considered as set at rest by the distance being fixed at 4 ft. 8½ in., the usual width, on the advice of Mr. Locke.

Glasgow and Greenock Railway.—The first stone of this railway was laid with masonic honours on Thursday, June 14th.—*Caledonian Mercury.*

Glasgow and Ayrshire Railway.—The foundation-stones of the bridges over the Garnock and Irvine rivers were laid with great ceremony on Thursday, the 28th ult.

Dublin and Drogheda Railroad.—The works of this great national undertaking will commence immediately. The contract for the first seven miles and a half—namely, from the Royal Canal, near the North Strand, to Stapolin, in the county of

Dublin, has been taken by Mr. Weakes, an eminent builder from Wexford. The contract for the remainder of the line remains still open, but the contractors will shortly be declared. For the portion which Mr. Weakes has got, his estimate was 49,000*l*. Mr. Dargan, who was the contractor for the Dublin and Kingstown line, put in an estimate for the same distance at 85,000*l*. Messrs. Doolin, Bennet, Henry, and Co., put in an estimate at 72,500*l*. It is gratifying to state that although there has been considerable delay, the shareholders will be benefitted by the reduced rate at which the work will be done, owing to various discoveries in that species of mechanism applicable to railroad making, and the increased skill which experience must bring to the performance of any difficult task. Some four or five years ago there was comparatively little known of railroad works.—*Dublin paper.*

Railway Speed.—The Sun engine, which brought down the seven o'clock train from Manchester last night, accomplished the distance—31 miles, to the mouth of the tunnel—in the short space of 41 minutes. This is at the rate of one mile in 80 seconds, or 45 miles per hour.—*Liverpool Journal, June 16.*

Railway conveyance is daily adding value to all sorts of agricultural produce. "We have heard," says the *Shrewsbury Chronicle*, "an extensive Staffordshire grazier state his confident opinion, that, were a railway constructed from Birmingham to Shrewsbury, it would increase, by 1*l*. per head, the value of every fat beast in the counties of Montgomery and Salop, by the facility it would afford for conveying them, without loss or delay, to the markets where they are chiefly consumed."

Conveyance of Sheep by Railways.—On Friday, a train on the London and Birmingham Railway, impelled by three engines, conveyed 1,652 fat sheep from Denbigh-hall to London. The opinion of the drovers, who may be supposed to understand the subject as well as any others, and are less likely to be prejudiced in favour of the utility of railways for this purpose, is, that the old mode, when the railway is complete, will be superseded; not that the expense is materially lessened, but that the animals arrive at their destination from 5 to 7 per cent. more valueable than after a journey of 50 miles by the road.—*Bucks Herald.*

A Locomotive Village.—The Messrs. Lyons, coachmakers of this city, are building a small moveable village for the Utica and Syracuse Railroad. This company have now on their road two steam-engines, which drive the piles upon which the road is built, and saw them off at the proper level; the rails are then laid, and the road completed as they go along. The "village," consisting of a number of neat looking cottages, is to be placed on the road in rear of the pile-drivers, for dwelling-houses for the mechanics and labourers on the road. Improvements will never stop; and we shall yet see the time when one may take a tea-kettle in his hand, put a few chips in his pocket, get astride a broomstick, and go where he pleases.—*Utica Democrat.*

Railway Casualties.—For 471 detentions on the Grand Junction Railway the following causes are assigned:—

Broken axles of engines, tenders, and waggons	19
Failure of pumps, eccentrics, connecting-rods, cotters, &c.	34
Bad coke and fires burnt out, &c.	42
Heavy trains	59
High winds	25
Obstructions from cattle waggons, and breaks down	13
Detentions from goods and second-class trains, &c., on Liverpool and Manchester Railway	107
Engines more or less out of order, the number not being sufficient	68
Rails slippery	26
Detentions in watering	22
Horses kicking out the sides of horse-boxes	4
Waiting for London mails at Birmingham (time deducted)	7
Engines and waggons getting off the road at points	6
Waiting for Manchester train at Warrington	39
Total	471

—*Commons Paper*, No. 267.

Private Bills.—As a proof of the manner in which private Bills are often smuggled through the Houses of Parliament, the Aylesbury News states, that the first intimation the inhabitants of Aylesbury and Thame had of the Aylesbury and Thame Railroad Bill was the notice in the papers of last week, that the Bill had received the Royal assent.

Railway Mails.—It may not be generally known that for some weeks past a carriage has been travelling on the London and Birmingham Railroad in which the business of a post-office is conducted. Letters are taken in, sorted, and left at different stations on the line. The progress, however, of the train has been considerably retarded by the necessity of stopping it to take up and leave letter-bags. This difficulty has at length been obviated by a plan recently submitted to the Post-office authorities, by a gentleman who has invented a means of exchanging the mail bags at the various stations in question, without in the least checking the speed of the train; and from the experiments which have been tried on the railroad above referred to, in the presence of the directors, engineers, and proper officials, it has been satisfactorily proved that by the adoption of this plan, the bags can be exchanged without danger or difficulty, and with certainty, at whatever rate of speed the carriage may be travelling. Upon several occasions this desirable object was accomplished at a rate equal to thirty miles an hour.

Cheap Travelling.—Henceforth no foot passengers will be allowed to travel on the railway between Stockton and Middleborough; but carriages will be attached to trains to carry travellers at *two pence* each! The distance is four miles.

ENGINEERING WORKS.

Westminster Bridge.—In consequence of the defective and dangerous state of the piers of this bridge, owing to their having been built in caissoons and lowered down to the bed of the river without removing the stratum of gravel and sand, the current which has become very strong since the removal of old London Bridge, is by its constant action completely undermining the whole fabric. The engineer likewise neglected the precautionary measure of fixing sheet piling round the piers, excepting in the case of four: the consequence is, that all the remaining piers must now be surrounded with coffer dams, for the purpose of effectively securing the foundations. This will be done by driving sheet piling into the substratum, which is clay; as well as other measures for the security of the foundations. The works have commenced, under the direction of Messrs. Walker and Burgess; Mr. Cubitt, of Gray's Inn Road is the contractor: amount of tender 67,000*l*.

Suspension Bridge from Hungerford Market to Lambeth.—This work is about to be commenced immediately, under the direction of Mr. Brunel; Messrs. Grissell and Peto are the contractors.

Ardglass Lighthouse.—A lighthouse has been commenced at Ardglass; the foundation was laid towards the end of June. We hope soon to have similar intelligence to give respecting a lighthouse at St. John's Point.—*Down Recorder.*

Granton Pier.—The Caledonian Mercury gives a long account of the festivities in honour of the opening of this pier and of her Majesty's coronation on Thursday June 28. It was named the Victoria Jetty.

The Caledonian Canal.—This truly magnificent work consists of a series of canals and navigable locks, extending from Corpach Basin, in the tideway of Lock Eil, at the north end of Linnhe Lock, near Fort William, to the Moray Firth, on the west side of Inverness. The total length of this navigation is 60½ miles, of which 23 miles are artificial cutting, and the remaining 37 miles are natural lochs or lakes, which have been rendered navigable. This canal being projected chiefly with a view to facilitate the trade between the Baltic, the western ports of Scotland and Ireland —is 15 feet deep throughout; its surface breadth is 120 feet, and its breadth at bottom 50 feet. Its summit level is 91 feet above the sea at low water; it has 28 locks, which are each 172 feet long. Eight of these locks, situated at the eastern side of this navigation, to which the name of Neptune's Staircase has been given, are considered to be works of the very first order, and to attest the skill of the engineer, the late Mr. Telford. The cost of this canal, according to the report of the Commissioners appointed for superintending its execution, was 1,005,770*l*.; it was opened for traffic in October, 1822, but has hitherto been but little used, and as a speculation may be considered unprofitable. The tolls received in the year ending 1st May, 1835, were 2,232*l*., while the cost of maintaining the canal during that year was 3,596*l*., leaving a deficiency upon the year of 1,188*l*., exclusive of any charge for interest on the capital expended. This result may in part be attributed to the discriminating duties upon European timber in favour of our North American colonies, which has materially interfered with the branch of trade upon which reliance was chiefly placed for producing an adequate return for the capital expended. It appears from a report recently made by the Commissioners to whom the management of this canal is entrusted, that the traffic upon it is increasing. In the winter of 1836-37, several Baltic trading vessels passed through, and the further employment of steam vessels has opened a considerable traffic in sheep and black cattle between the Highlands and Glasgow.—*Progress of the Nation.*

ENGINEERING WORKS IN SCOTLAND.

The principal engineering works in course of execution in Scotland, on which bills have been obtained, are the following. Those marked * have not as yet been commenced.

* Edinburgh and Glasgow Railway	Engineers,	Grainger and Miller.
Glasgow and Greenock Railway	„	John Locke.
Dundee and Arbroath Railway	„	Grainger and Miller
Slamannan Railway	„	J. Macneill.
Wishaw and Coltness Railway	„	Ditto.
Glasgow, Ayr, and Kilmarnock Railway	„	Grainger and Miller.
Grangemouth Harbour and Dock	„	J. Macneill.
Forth and Cart Junction Canal	„	Ditto.
* Campsie Canal	„	Ditto.
* Blockhairn Canal	„	Ditto.
Paisley Water Works	„	— Thom.
Granton Harbour and Pier	„	J. Walker.
Edinburgh and Newhaven Railway	„	H. H. Price.
Dalkeith and Leith Railway	„	— Rankine
Polloc and Govan Railway	„	J Macneill.
Port Glasgow Docks	„	J. Walker.
River Clyde Navigation	„	Ditto.
River Cart Navigation	„	J. Macneill.

There are also considerable improvements in course of execution in the Docks at Dundee and Aberdeen.

NEW CHURCHES.

St. James's Church, Holloway.—On Tuesday, June 19th, the first completed of three district churches now in course of erection in the parishes of Islington and Holloway, was consecrated by the Right Rev. the Lord Bishop of London. The architectural character of the building is Grecian; it was designed and executed under the superintendence of Messrs. Inwood and Clifton, the architects. It is calculated to accommodate 1,100 persons, 300 of whom are provided with free sittings. The whole cost of the building has not exceeded 3,200*l*., out of which "The Bishops' Fund" has contributed 1000*l*., and the remainder has been raised by voluntary contributions of the parishioners.

All Saints Church, King's Cross.—On Thursday, the 5th ult., the above structure, which is the second completed out of three district churches within the parish of Islington, underwent the ceremony of consecration by the Right Rev. the Lord Bishop of London, in the presence of a crowded congregation. It was designed and executed, in the Gothic style of architecture, by W. Tress, Esq. It is calculated to accommodate 1,000 persons, to nearly 300 of whom are allotted free sittings; the whole cost of the building will not exceed 3,200*l*., 1,000*l*. of which is subscribed by the Metropolis Churches Fund, and the remainder by the voluntary subscriptions of the parishioners.

Lambeth.—The Archbishop of Canterbury has given a piece of ground in Carlisle Lane, upon which a chapel will be forthwith erected, which will, when completed, afford accommodation for 1,000 persons. The cost of the building (3,400*l*.) will be defrayed by the commissioners appointed for the rebuilding of churches, &c. Edward Blore, Esq., of Welbeck-street, Cavendish-square, is the architect.

St. Helen's.—A new church is about to be built at St. Helen's, by P. Greenall, Esq, one of the Tory Candidates for Wigan at the last election. The foundation stone was laid by his lady on the day of the Coronation. The church is to be built in the early pointed style; of brick, with stone dressings, pinnacles &c. The nave will be 90 ft. by 30 ft.; and the transepts 67 ft. by 30 ft. It will have galleries at the West end and in the transepts; and is calculated to contain 960 persons, and to cost £3,500. The tower, to which there will be no spire, is to be about 13 ft. square, and 70 ft. high. Messrs. A. and G. Williams of Liverpool, are the architects. K. C.

Church for the Blind and the Deaf and Dumb.—The beautiful church between the Blind Asylum and the School for the Deaf and Dumb, at Old Trafford, was opened for the permanent celebration of divine service on Sunday, June 10th.

Holy Trinity Church, Freckleton.—This new church was consecrated on Wednesday, June 13th, by the Bishop of Chester. It is a neat building of brick and stone. Its dimensions inside are 58 feet long by 27 wide; outside, 80 feet long; and the tower and spire are elevated 58 feet. There is no gallery in the church, but precautions have been taken to allow one to be put in, and as his lordship recommended such an addition, it will most probably be made. The present accommodations are 350 sittings. Mr. Latham, the architect, of this town, had the superintendence of the erection, and the very neat and chaste appearance of the building is highly creditable to his skill.—*Preston Pilot.*

St. Mary's Church, Preston.—This new church, which is situate in Blacow-street, at a short distance from the House of Correction, was consecrated on Wednesday, June 13th, by the Bishop of the diocese. It is built of hewn stone in the Norman style of architecture. Its inside dimensions are 72 feet long by 42 feet wide; and the outside extreme extent, including both the tower and chancel, is 108 feet. The height of the spire from the threshold to the finial, is also 108 feet. The accommodations in the body of the church and the two side aisles, are for 600 persons, and in the gallery which is a front one, and very spacious, being 50 feet in depth, 500 sittings are provided. The reading desk is placed on one side of the church, near the communion, and the pulpit on the other. The altar screen, behind which is the vestry, is at present in an unfinished state, but is intended to consist of a succession of arches, with deep pillars and mouldings. The noble Norman arch, with its massy pillars, which seems to enclose and guard this portion of the sacred building, has a very imposing effect, and bears a strong resemblance to, though it is not throughout an imitation of, an arch in the venerable cathedral at Durham.—*Preston Pilot*

PUBLIC BUILDINGS AND IMPROVEMENTS.

The Reform Club.—This building is about to be commenced immediately on the site of the old building adjoining the Travellers' Club-house, Pall Mall. A description of Mr. Barry's Design was given in No. 4 of our Journal page 67. Messrs. Grissell and Peto are the contractors: amount of tender, under 38,000*l*.

The Entrance to the Birmingham Railway at the Terminus, Euston Square is, now finished; the massive iron gates were fixed during the last month.

Bartholemew's Hospital.—Considerable additions are to be made to this building; it is reported to the amount of 22,000*l*.

Bethlem Hospital.—The first stone of a very extensive addition to this great institution was laid on Thursday, July 26th; Sydney Smirke, Esq. is the Architect.

Liverpool, July 8, 1838.—The so-called foundation stone of the St. George's Hall was laid on the Coronation day, on land in Lime Street; the Town Council reserving to themselves the right of removing it to any more convenient part of the same ground. It is intended to advertise for designs (which it is to be hoped will be publicly exhibited); and it is expected that the leading architects of the country will contribute.

The Apothecaries' Hall is approaching completion, the company having taken possession of part of the premises. It is said to have cost twenty thousand pounds already, and they talk of laying out a thousand in the fittings up alone of the sale room. It is rather an extraordinary building; and perhaps the architects Messrs. Cunningham and Holme would furnish drawings of it for the instruction and amusement of your numerous readers.

Mr. Foster's last,—as it is generally hoped,—the Custom House, is also nearly completed. K. C.

St. Helen's.—A Town Hall is proposed to be built in the market-place of St. Helen's; designs for which were advertised for. I understand that the Messrs Williams's design was approved and that Mr. Broadbent, likewise of Liverpool, obtained the premium for the second best. K. C

Carlisle.—A Literary Institution is about to be built at Carlisle, the designs for which were also advertised for; the particulars, some of your correspondents there, can perhaps provide. K. C.

FOREIGN INTELLIGENCE.

Paris.—M. Geu, a native of Cologne, has been commissioned to erect a church in the quarter of St. Germain; and as the choice of the style has been left to him self, he has determined in favour of the Gothic, as better adapted than any other to the service of the Catholic religion. Some months, however, will elapse before the building will be commenced. Several architectural undertakings are now in progress; among others, the Marché de la Madeleine

Naples.—The portion of the Royal Palace now rebuilding after the fire, will greatly extend the whole edifice, and form an entirely new façade towards the sea. The King has directed that one of the houses at Pompeii shall be completely restored, decorated, and furnished in every respect according to what has been ascertained on the subject from the discoveries that have from time to time taken place. Such a restoration will exemplify, within a brief compass, the domestic architecture and taste of the ancients far more distinctly than the contents of an entire museum, or of numerous volumes.

Vienna.—The plan for the new Custom House has been approved of by the Emperor; and three million guldens are to be appropriated to the erection of the edifice, which will be on the bank of the Danube, below the Invalid Hospital. It is said the design resembles that of the Custom House at Dublin.

Carlsruhe.—A building for a Picture Gallery has been lately commenced from the designs of Bourath Hubsch, the architect of the new Catholic Church at Bulach; which latter edifice is in the so-called Byzantine style, and has a nave and two side isles.

Mechlin.—The idea of completing the celebrated tower of the Cathedral (348 feet high) has been abandoned, the committee appointed for the purpose having reported that it would be impracticable to carry it up any higher.

Railway from Paris to Versailles.—The works on the right bank of the river, have been commenced along the whole line from Asniers to Montreuil, upon which 3,800 men and 600 horses are actively employed. On the line between St. Germain and Versailles, 400 men are at work.

New Masts for Steamers.—At a late meeting of the Academie des Sciences, a memorial from M. Bechameil, an officer of the navy, was read, describing a new means, invented by himself, of fitting steamers with masts, which may be set up and taken down again in less than two hours. The great object of the invention is to save consumption of fuel when the wind is sufficiently favourable to impel the vessel without the use of her engines; and the masts consist of a great number of short spars, capable of being so well joined together that they are equal in solidity to ordinary masts. It was stated at the meeting that M. Bechameil had obtained authority from the minister of marine to fit out a vessel on this plan, and to make an experimental voyage with it to Rio Janeiro.—*Paris Paper.*

Liege.—A great improvement is on the point of being introduced at Liege. Every street lamp is to have one pane of ground glass with the name of the street painted on it, so as to be equally visible in the daytime or when lighted by gas. Corner lamps to have the names both of the principal and the cross streets.

A remarkable celestial phenomenon was observed at Toulouse, about half-past 9 in the evening of June 25th. The heat had been oppressive throughout the day, and the atmosphere had become opaque, but without any appearance of a storm. In the midst, however, of the obscurity, a streak of fire of a pale ashy colour rose from the horizon, and was lost in the zenith. This continued at regular intervals for about a minute and a half, alternately weak and strong, moving in a southerly direction, and parallel to the magnetic meridian.—*French Paper.*

Edruanedorff.—On the 8th of June, in the morning, the newly erected church steeple of Edruanedorff, 110 feet high, fell down. Unhappily, several persons lost their lives. An inquiry is commenced to discover whether this misfortune is to be ascribed to any negligence.—*German Paper.*

A remarkable land slip, as the Frankfort Journal states, has taken place at Tetschen, in Bohemia, where a surface of eight or ten acres, principally forest land, has sunk and continues to sink from its place, on the side of a mountain. In some spots, the earth has given way only to the extent of a few feet, but in others it has fallen 50 feet, so that the trees have disappeared.

Tobacco and Steam.—The Emperor of Russia has, it seems, imposed a tax upon tobacco which will yield 80,000,000 of rubles, to be applied to the formation of railroads and to the promotion of steam navigation. This, it must be admitted, is judiciously converting one smoke into another.

The Pacha's New Steamer.—A steamer, recently built at the Pacha's dockyard, of 140-horse power, with English engines, has been put under the direction of the Tuscan Consul, who has named her the Generoso. She departed on the 28th of April, on her first trip to Constantinople, under Tuscan colours, and is intended to run between that place and Alexandria direct every twenty days. On the 15th of May she returned to Alexandria, being six days from Constantinople; during her passage she was near catching fire three times. Although the engineers on board this vessel are Englishmen, the rest of the crew are made up of Italians, and others little accustomed to regularity and discipline, and consequently not to be trusted with the navigation of a steamer.—*Malta Gazette.*

Baltimore to Philadelphia.—Passengers are now transported by the new railroad and steam boat line from Baltimore to Philadelphia in six hours and a half.—*Montreal Transcript.*

MISCELLANEA.

Steam Carriage.—The first carriage of the Steam Carriage and Waggon Company (built after the experimental carriage had been proved) will be set to work, we understand, within a month. We have also heard that companies are already forming in France, Belgium, and America, under the most favourable auspices. We look forward with great anxiety to the arrival of the first carriage in London, and shall have pleasure in laying the particulars before our readers.—*Conservative Journal.*

Steam-cabs.—On Friday afternoon, June 22nd, Hyde park presented a more than usually gay appearance in consequence of a crowd of fashionables being assembled to witness the trial of a newly constructed steam cab. Among the many splendid equipages, were observed those of the Dowager Countess of Sutherland, the Marquis of Salisbury, the Marquis of Northampton, the Earl of Winchilsea, the Earl of Warwick, Lord Howick, Lord Holland, and many other distinguished personages. About three o'clock the object of attraction moved forward at a slow pace from the old Foot-guard-barracks, Knightsbridge, and threaded its way through the various vehicles into the park, passing through the centre gate of the triumphal arch, and making, in the open space opposite the statue, several turns within its own length. The vehicle was then propelled with apparent ease for three or four hours round the park, and, from the slight noise it made, the horses passing did not appear to be frightened. The average speed of the cab was about 12 miles an hour. The vehicle was guided by Mr. Hancock, the inventor.—*Standard.*

Stafford's Safety Coach.—On Wednesday the 4th ult. the renewal of the patent for Stafford's safety-coach was discussed before the Lords of the Privy Council. Several beautiful models and drawings of the coach were exhibited, every part of which was minutely examined by Lord Brougham and Lord Lyndhurst. The former noble and learned lord was so interested with the subject as to request the patentee to attend at his lordship's residence, in order to a private exhibition of the invention. Mr. John Alexander Galloway, the engineer, stated that he considered the invention most useful, and that he had closely attended to an experiment which confirmed his opinion as to the impossibility of a coach made upon the patentee's plan upsetting. Lords Brougham and Lyndhurst recalled this witness, and examined him upon many of the details, which he fully explained to their lordship's satisfaction. Mr. Gray, of Earl-street, and several well-known *whips*, and others, spoke to the merits of the patent, and the difficulties which Mr. Stafford had to encounter in working it; after which their lordships ordered that the patent should be renewed for seven years, being the full term.

New Hay Rake.—A new rake has been introduced into this country, which promises to be of material benefit to the farmer during the hay-making season. It is an American invention, and consists of a light beam or stock, nine feet in length, to which are attached rows of teeth, both before and behind. It is drawn over the sward by a horse, and as soon as the interstices between the teeth are filled, the workman in attendance moves a handle, which turns the rake right over, and presents the side which has hitherto been empty. In this manner the hay is deposited in little heaps throughout the field. The principal advantages of the implement are that it vastly economises labour in a very busy season, and at the same time sweeps the field with the greatest nicety.—*Dumfries Courier.*

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH JUNE AND THE 26TH JULY 1838.

NATHAN DEFRIES, of Paddington Street, in the County of Middlesex, Engineer, for "Improvements in Gas Meters."—27th June; 6 months.

JOHN PERRY, of Leicester, in the County of Leicester, Wool Comb Maker, for "Improvements in Combing Wool."—27th June; 6 months.

CHARLES GREEN, of Birmingham, in the County of Warwick, Gold Plater, for "Improvements in the Manufacture of Brass and Copper Tubing."—27th June; 6 months.

DANIEL BECKHAM, of No. 22, Sussex Place, Old Kent Road, in the County of Surrey, Stereotype Founder, for "An Improved mode of obtaining Castings in Gold, Silver, and Albata."—27th June; 6 months.

JAMES ROBINSON, of Huddersfield, in the County of York, Merchant, for "An improved method of producing, by dyeing, various Figures, or Objects of various Colours, in Woollen, Worsted, Cotton, Silk, and other Cloths"—27th June; 6 months.

EDWARD WHITE BENSON, of Birmingham, in the County of Warwick, Manufacturing Chemist, for "Improvements in the Manufacture of Carbonate of Lead."—27th June; 6 months.

RICHARD BADNALL, of Cottin Hall, in the County of Stafford, Gentleman, for "An Improvement in the Manufacture of Carpets and other similar Woven Fabrics, which Improvement is effected by the introduction of a certain Article of Commerce not hitherto so employed or used in such Manufacture."—27th June; 6 months.

GEORGE ROUND, of Birmingham, in the County of Warwick, Lock Filer, and SAMUEL WHITFORD, of the same place, Die Sinker, for "A new and improved method of Manufacturing certain of the parts of Gun and Pistol Locks."—30th June; 6 months.

HARRISON GRAY DYER, of Cavendish Square, Gentleman, and JOHN HEMMING, of Edward Street, Cavendish Square, Gentleman, both in the County of Middlesex, for "Improvements in the Manufacture of Carbonate of Soda."—30th June; 6 months.

AUGUSTUS WILLIAM JOHNSON, of Upper Stamford Street, in the Parish of St. Mary, Lambeth, in the County of Surrey, for "Certain Improvements for preventing the Incrustration of Steam Boilers, or Generators, or Evaporating Vessels."—30th June; 6 months.

MATTHEW UZIELLI, of Fenchurch Street, in the City of London, Merchant, for "Improvements in Locks or Fastenings: communicated by a Foreigner residing Abroad."—30th June; 6 months.

WILLIAM DOBBS, of the Penn Road, Wolverhampton, in the County of Stafford, Brass Founder, for "Improvements in the Construction of Racks and Pulleys for Window Blinds, and other useful purposes."—30th June; 6 months.

GEORGE CARTER, of Lombard Street, in the City of London, Gentleman, for "Improvements in Saw Mills."—2nd July; 6 months.

JOSEPH NEEDHAM TAYLOR, of Red Lion Square, Bloomsbury, in the County of Middlesex, a Captain in her Majesty's Royal Navy, for "A certain method or certain methods of abating or lessening the Mischiefs arising from the shock or force of the Waves of the Ocean, Lakes, or Rivers, and of reducing them to the comparatively harmless state known by the term Broken Water, and thereby preventing the Injury done to, and increasing the durability of Breakwaters, Moleheads, Piers, Fortifications, Lighthouses, Docks, Wharfs, Landing Places, Embankments, Bridges, or Pontoon Bridges; and also of adding to the Security and Defence of Harbours, Roadsteads, Anchorages, and other places exposed to the violent action of the Waves."—4th July; 6 months.

EDWARD DAVY, of Fleet Street, in the City of London, Chemist, for "Improvements in Apparatus for Making Telegraphic Communications or Signals, by means of Electric Currents, parts of such Apparatus being applicable to Obtaining, Regulating, or Measuring Electric Currents for other purposes."—4th July; 6 months.

FREDERICK JOSEPH BURNETT, of St. Mary at-Hill, in the City of London, Ship Insurance Agent, and HIPPOLYTE FRANCOIS, Marquis de BONFFET MONTAUBAN, Colonel of Cavalry, now residing in Sloane Street, Chelsea, in the County of Middlesex, for "Certain Improvements in the Manufacture of Soap."—4th July; 6 months.

HENRY ELKINGTON, of Northfield, in the county of Worcester, Gent., for "Improvements in Engines, to be worked by Steam, Air, or other Fluids."—6th July; 6 months.

CORNELIUS ALFRED JAQUIN, of Huggin Lane, Wood Street, in the City of London, for "Improvements in the Manufacture of Buttons."—7th July; 6 months.

WILLIAM KNIGHT, of the City of Chichester, in the County of Sussex, Ironmonger, for "Improvements in Machinery for raising and forcing Water, and other Fluids."—7th July; 6 months.

GEORGE SALTER, of West Bromwich, in the County of Stafford, Manufacturer, for "Improvements in Apparatus for Weighing."—9th July; 6 months.

CLAUDE SCHROTH, of Leicester Square, in the County of Middlesex, Gentleman, for "An improved Method or Methods of Making or Manufacturing the Tools or Apparatus employed in the process of Pressing or Embossing the Surface of Leather, or other Substances. Communicated by a Foreigner residing Abroad."—9th July; 6 months.

WILLIAM PALMER, of Sutton Street, Clerkenwell, in the County of Middlesex, Manufacturer, for "Improvements in Lamps."—10th July; 6 months.

WILLIAM BARNETT, of Brighton, in the County of Sussex, Iron-Founder, for "Certain Improvements in the Manufacture of Iron."—10th July 6 months.

JOHN THOMAS BETTS, of Smithfield Bars, in the City of London, Rectifier, for "Improvements in the Process of Preparing Spirituous Liquors in the Manufacture of Brandy."—10th July; 6 months.

LOUIS CYPRIEN CALLETT, late of New York, in the United States of America, but now residing in Manchester, in the County of Lancaster, Merchant, for "Certain Improvements in Machinery or Apparatus for producing Motive Power, applicable to Propelling Boats and other Vessels, Carriages, Machines, and other useful Purposes. Communicated by a Foreigner residing Abroad."—11th July; 6 months.

HENRY VAN WART, of Birmingham, in the County of Warwick, Merchant, and SAMUEL ASPINWALL GODDARD, of the same place, Merchant, for "Improvements in Machinery or Apparatus applicable to Locomotion on Railroads, and to Steam Navigation, parts of which Improvements are also applicable to Land or Stationary Engines."—11th July; 6 months.

JOHN BETHELL, of Mecklenburgh Square, in the Parish of St. Pancras and County of Middlesex, Gentleman, for "Improvements in rendering Wood, Cork, Leather, Woven and Felted Fabrics, Ropes and Cordage, Stone and Plaster, or Compositions, either more durable, less pervious to Water, or less inflammable, as may be required, for various useful Purposes."—11th July; 6 months.

JOB CUTLER, of Lady Poole Lane, Sparkbrook, in the Parish of Aston, in the Borough of Birmingham, in the County of Warwick, Gentleman, and THOMAS GREGORY HANCOCK, Machinist, of Princes Street, in the Borough of Birmingham aforesaid, for "An improved Method of Condensing the Steam in Steam Engines, and supplying their Boilers with Water thereby formed."—12th July; 6 months.

JOSEPH BENNETT, of Tinnley, near Glossop, in the County of Derby, Cotton Spinner, for "Improvements in Machinery for Carding Wool, Cotton, Flax, or other Fibrous Substances which are or may be carded; part of which Improvements are also applicable to Machinery for drawing, doubling, and roving and spinning such Fibrous Substances as are or may be subjected to those operations."—12th July; 6 months.

JAMES MILNE, of Edinburgh, Gas Meter Manufacturer, for "Improvements in Apparatus employed in transmitting Gas for the purposes of Light and Heat."—13th July; 6 months.

ALEXANDER COCHRANE, of Arundel Street, Strand, in the County of Middlesex, Gentleman, for "Improvements in Umbrellas and Parasols."—13th July; 6 months.

THOMAS ROBERT SEWELL, of Carrington, in the County of Nottingham, Lace Manufacturer, for "Improvements in Manufacturing White Lead."—14th July; 6 months.

RICHARD MARCH HOE, late of New York, in the United States of America, but now residing at 66, Chancery Lane, in the County of Middlesex, Civil Engineer, for "A new or improved Instrument or Apparatus for ascertaining or determining the Latitude and Longitude of any Place, or the Situation of Ships or other Vessels at Sea, and the Dip and Variation of the Magnetic Needle; which new or improved Instrument he intends to denominate 'Sherwood's Magnetic Geometer.' Communicated by a Foreigner residing Abroad."—18th July; 6 months.

HENRY ROSS, of Leicester, Worsted Manufacturer, for "Improvements in Machinery for Combing and Drawing Wool, and certain descriptions of Hair."—18th July, 6 months.

HENRY BRIDGE COWELL, of Lower Street, Islington, in the County of Middlesex, Ironmonger, for "An improved Apparatus answering the purpose of a Press, for retaining and keeping Leaves or pieces of Paper or Cloth; or of other thin Substances, folded or unfolded, in a flattened Condition, under a gentle Pressure."—18th July; 6 months.

JOHN ROBERTSON, of Great Chartlotte Street, Buckingham Gate, in the County of Middlesex, Gent., for "Improvements in Architecture, in its Forms and Combinations, and also in the superficial Figures which may be employed; also for an Improvement or Improvements in the Surfaces of Buildings."—18th July; 6 months.

RICHARD TREFFRY, of Manchester, in the County of Lancaster, Chemist, for "Certain Improvements in the Method of Preserving certain Animal and Vegetable Substances from decay; and also in the Apparatus for, and mode of Impregnating Substances to be preserved."—23rd July; 6 months.

GEORGE RICHARDS ELKINGTON, and OGLETHORPE WAKELIN BARRATT, of Birmingham, in the County of Warwick, Manufacturers, for "Improvements in the coating and colouring certain Metals."—24th July; 6 months.

JOSEPH PRICE, of the Parish of Gateshead, in the County of Durham, Flint Glass Manufacturer, for "Certain Improvements in constructing and adopting Boilers for Marine, Stationary, and Locomotive Engines, and in adapting and applying Boilers to Steam Vessels."—26th July; 6 months.

CHARLES WYE WILLIAMS, of Liverpool, in the County Palatine of Lancaster, Gent., for "Certain Improvements in the means of preparing the Vegetable material Peat-moss or Bog, so as to render it applicable to several useful Purposes, and particularly for Fuel."—26th July; 6 months.

JOHN GRAY, of Liverpool, in the County of Lancaster, Engineer, for "Certain Improvements in Steam Engines, and Apparatus connected therewith; which Improvements are particularly applicable to Marine Engines, for propelling Boats and Vessels, and Part or Parts of which Improvements are also applicable to Locomotive or Stationary Steam Engines, and other Purposes."—26th July; 6 months.

WILLIAM MADELEY, of Manchester, in the County of Lancaster, Machinist, for "Certain Additions to, and Improvements in, Machinery used for Spinning and forming into Cops upon Spindles, Cotton and other Fibrous Materials of the like Nature."—26th July; 6 months.

SIR WILLIAM BURNETT, Knight, Commander of the Royal Hanoverian Guelphic Order, of Somerset House, in the County of Middlesex, for "Improvements in Preserving Wood and other Vegetable Matters from decay."—26th July; 6 months.

ALEXANDER EROLL, of Greenwich, in the County of Kent, Manufacturing Chemist, for "Improvements in the Manufacture of Gas for the Purpose of affording Light."—26th July; 6 months.

FREDERIC EDOUARD FROISSINET, of Covent Garden Square, in the City of Westminster, for "Certain Improvements in the Machinery for Propelling Vessels by Steam, by which their Speed will be much accelerated, with a diminished Power and with a diminished Action in the Water. Communicated by a Foreigner residing Abroad."—26th July; 6 months.

NOTICES TO CORRESPONDENTS.

Several communications came too late for insertion in our present number; we shall give them early attention. We beg to remind our Correspondents that "*Communications should be sent on or before the 25th instant*;" if accompanied with drawings, they should be considerably earlier. We have however to postpone a communication from K. C. for which we have not this excuse; but can only say that our matter has swelled beyond our limits. It would be a great convenience to Journalists if among the many modern applications of Indian rubber some ingenious artist would invent a "patent elastic caoutchouc paper," which should expand as matter flows in, towards the end of the month. In default of such a resource, we have for once been obliged to devote our whole space to matter, omitting our usual two pages of advertisements.

COLE AND TAYLOR, PRINTERS, CRANE-COURT, FLEET-STREET.

REMARKS ON THE IRISH RAILWAY COMMISSIONERS' REPORT.

(Accompanied by a Map.)

We give a small map accurately traced with the railways proposed by the Irish Railway Commissioners, and also by the different capitalists and joint-stock companies, to afford facilities to whom, in judging of the most advantageous mode in which investments in railways can be made, the commission was really appointed. The railways proposed by the commissioners are indicated by dotted lines, and the companies' railways are shown in continuous black lines.

References to Map.

1—Ulster Railway, now in progress, Armagh to Belfast.
2—Cave-Hill Railway, ditto.
3—Belfast and Carrickfergus Railway, to Larne Harbour; and to communicate with Scotland by steam-vessels.
4—Hollywood Railway, surveyed.
5—Proposed Railway, surveyed, Armagh to Port Rush.
6—Line of the Dublin and Armagh Railway Company, surveyed.
7—Proposed Coast Line, recommended by the Irish Railway Commissioners.
8—Proposed Railway, by the Commissioners.
9—Drogheda Railway, Coast Line; act obtained.
10—Dublin and Kingstown Railway, finished.
11—Proposed extension to Bray, recommended by the Commissioners.
12—Dublin and Kilkenny, act obtained.
13—Dublin to Mullingar, surveyed.
14—Proposed Line to Sligo.
15—Ditto ditto to Galway, surveyed.
16—Ditto ditto to Castlebar and Westport.
17—Dublin to Limerick, surveyed.
18—Dublin to Limerick, proposed by the Commissioners.
19—Limerick to Waterford, act expired.
20—Dublin to Cork, recommended by the Commissioners.
21—Ditto to Berehaven, ditto ditto.
22—Proposed Railway to Valentia.
23—Branch Line to Kilkenny, proposed by the Commissioners.
24—Proposed extension from Kilkenny to Waterford.
25—Ditto ditto to Wexford, from Carlow.
26—Ditto ditto from Dundalk to Cavan.
27—Ditto ditto from Drogheda to Navan and Longford.
28—Ditto ditto from Limerick to Ennis.
29—Ditto ditto from Dublin to Blacksod and Broadhaven.
30—Ditto ditto from Enniskillen to Londonderry, surveyed.
31—Proposed Railway from Dublin to Enniskillen, recommended by the Commissioners.

It appears by the map, that the commissioners give from Dublin to the North of Ireland two lines—one along the coast they permit, and another line inland they particularly recommend—the two run nearly parallel with each other. The act for the former has been obtained by private interest—the authority for the latter is included by the commissioners in their scheme of a general railway law for all Ireland. We venture to predict that one or other of these lines must prove a failure, because it is utterly impossible that the trade of Ireland, however extended it may hereafter become, can suffice at present to keep up two such railways running so close and so parallel to each other. This is a case quite analogous to the unfortunate projects of the Grand and Royal Canals, which cross Ireland nearly parallel with each other, and upon the ruinous senselessness of which the commissioners animadvert in a manner no less pointed than just. On what grounds of reason these gentlemen, after condemning parallel lines of canal, could countenance two such lines of parallel railway, does not appear. Their inconsistency in this respect becomes the more apparent, when we find them insisting in another page upon the abandonment of the Dublin and Kilkenny Railway, because it runs parallel with the one they favour. We feel quite satisfied that no body of disinterested and impartial engineers would recommend two such projects. Can there be any foundation for the rumour that the fact of Mr. Pierce Mahony being solicitor to the Northern Coast Railway, has been quite enough to ensure to it the patronage of the commission? This is a question of some seriousness. Mr. Pierce Mahony's name has been associated with that commission in a very strange way; and it is not a little curious that although the commissioners repudiate the Dublin and Kilkenny Railway, they incline most graciously to a parallel line coastways from Dublin to Wexford, which has long been a pet project of Mr. Mahony's. To return however to the question more immediately before us. The company's entire line from Dublin to the North of Ireland, it is easy to show, would effect all the principal objects that the Irish Commissioners' two parallel railways could achieve. The company's line is sufficiently inland to embrace the whole of the interior central trade of the North; while on the other hand, it is convenient enough to afford short branch lines of railways to the respective towns situated on the very margin of the coast; thus thoroughly embracing every desirable object required by the country. How it then could have entered into the heads of any body of men—pretending we will not say to competent judgment, but even to common sense—to recommend two lines of railway running parallel to each other when one line of railway would effect all the objects required, is a mystery which we are quite unable to solve. Were the commissioners less gentlemen of rank and character than they really are, we should not hesitate to account for the thing by supposing some bias or partiality to exist; which is totally inconsistent with the performance of those duties intrusted to them by the government of the country, and that true independence which never fails to uphold those who are really qualified, when employed by their country to decide upon questions of the highest public importance.

This case is so plain and so simple when viewed on the map, that men, the most humbly-gifted with scientific or statistical information upon the subject, will at a glance see the very erroneous conclusion the Irish Railway Commissioners have arrived at, in thus recommending the execution of two parallel lines of railway from Dublin to the North of Ireland—the one to be made by government, and the other attempted, but not begun, by Mr. Pierce Mahony: the short result of all which would be just this—that nearly 100 miles of additional railway will be required to be made, and more than one million sterling to be unprofitably spent.

One objection taken to the inland company, is the expense of crossing the Boyne. As to that however we have to observe, that the company's line approaches at this point to within a short distance of the town of Drogheda; and that it is much less expensive to embank and bridge over the Boyne valley and river, than to make two lines of railway parallel with each other for a distance of nearly one hundred miles. When these gentlemen dwelt upon the expense of crossing the river Boyne, they doubtless forgot altogether some rather bold feats of a like kind, which are included in Mr. Mahony's coast line, which crosses not a river merely but whole bays, as for instance, those of Rush, Malahide, and Dublin. Then as to the statement that the company's inland line is not so good as the more inland one proposed by the commissioners; we apprehend that this is merely an hypothesis which can only be decided before a competent and impartial tribunal, by the evidence of experienced practical engineers. There is Mr. Rastrick for instance, who has surveyed several lines for the North of Ireland;—we should like to see such an engineer as that, called to disprove the assertion that the company's line, the line we are now speaking of, is the best as an engineer's project, and also the cheapest, and quite sufficient to answer all the purposes of passenger traffic and commerce, which the two parallel lines of railway, recommended by the Irish commission, could possibly accomplish; and which, as we have already observed, would save the making of near one hundred miles of parallel railway, or the unprofitable application of one million of money. We therefore invite public attention to these two recommendations of the Irish commissioners; confidently anticipating that the slightest examination of the maps and reports will convince all persons who will take the trouble to open their eyes and look at the lines, as delineated under this royal authority, how gross and palpable has been the blunder here committed. From their failure in this instance, we leave the reader to judge of their fitness to perform the important duties entrusted to them by the executive of the country,—duties, the nature and results of which were thus explicitly set before them in the Treasury minute, immediately consequent upon the issuing of the commission. "The main benefits to be obtained, appear to my Lords to be the impartial and authoritative information which may thus be laid before parliament, and which will aid the legislature in deciding between rival and conflicting interests,—the tendency which it will have of preventing ruinous competitions, and the losses and expenses of litigations before committees,—and the facilities which may be afforded to capitalists and to companies, to judge of the most advantageous mode in which investments in railroads can be made."

"My Lords have full confidence, from the character of the gentlemen appointed to form the commission, that their inquiries will be conducted in a satisfactory manner."—*Treasury Minute*, dated 3rd November, 1836.

From this rapid view of the proceedings of the railway commissioners in the North of Ireland, let us turn to look at another portion of their labours in the South and West of Ireland. We have seen how the anticipations of the Lords of the Treasury have been realized as to the North, let us seek to discover whether they have been more faithfully borne out in the South; because to us it is evident that the engineering projects proposed for the North by the railway commissioners, are not such as to give satisfaction,—not such as are at all worthy of either the confidence or approbation of the public; notwithstanding "my Lords had full confidence from the character of the gentlemen appointed to form the commission, that their inquiries would be conducted in a satisfactory manner."

It appears, on examining the maps and sections, that the distance from Dublin to Limerick, by the line proposed by the commissioners (dotted) is in length 128 miles 4 furlongs, and that of the company about 111 miles—difference 17 miles 4 furlongs in favour of the company's line. The commissioners' line, moreover, does not appear to pass through any of the large towns lying in the route between Dublin and Limerick, and so far it is on another account highly objectionable. Again, the characteristic gradient on the commissioners' line is 1 in 180, while that on the company's line is 1 in 330. So that the difference between the two lines is, first, that the company's line is 17 miles 4 furlongs shorter than that of the commissioners;—secondly, it passes through or close to all the large populous towns lying between Dublin and Limerick, while the commissioners' line passes through none of them, but traverses instead a country greatly inferior in soil and population;—and, thirdly, the characteristic gradient on the commissioners' line is 1 in 180, while on the company's line it is 1 in 330. The facts here stated, suffice to prove that the line proposed by the railway commissioners is inferior in every respect as compared to the line proposed by private enterprise; and therefore again the anticipations of their Lordships are unfortunately not realized even in the South.

The Railway Commissioners, by way of excuse for making their Dublin and Limerick line 17 miles 4 furlongs longer than the company's line, and getting inferior gradients, state that they have avoided the great expense of crossing the Shannon twice. Now what would the expense in question amount to? Two timber bridges could easily be constructed over the Shannon for 4,000*l*. each; and 8,000*l*., we are thus able to show, would cover the whole expense, for the ground is favourable for piles, and timber can be conveniently procured. We are bound to add, that it is not with a very good grace indeed that the commissioners complain of the expense of crossing the Shannon twice, or of any other expense; for what are their favoured enterprises in this way? Let the bridge work proposed by them in crossing Bantry Bay attest their practical wisdom, and command the admiration of a bold age of daring novelty. Where there is a depth of more than 60 feet of water, and a length of more than 500 or 600 yards, they have planned a stupendous bridge work 60 feet deep in the roaring sea, which is to be executed by the diving-bell. There are to be in one part of it alone, fourteen arches in a length of 400 yards, built in 60 feet of sea water, and to be 100 feet high from the bottom to the top. What is the crossing of the Boyne or the Shannon to this diving-bell construction, which requires to be built so deep in water, and is exposed to all the swell and run of the vast Atlantic Ocean? What is the Kingstown Railway sea-wall, which the tide annually demolishes, compared to this work, or any other on the shores of the empire? Why in truth one might as reasonably institute a comparison between the size of a blow-fly and the bulk of the Chimborazo Mountain. Yet are these experienced and practical engineers, the Irish Railway Commissioners, timid men, to cry out "Oh, the great expense of crossing the Shannon twice! Oh, the great expense of crossing the Boyne!" We grant that there is expense in such crossings, but what is the gain? Why a certain saving of more than 17 miles of railway. Surely that is an equivalent. But supposing, for the sake of discussion, just the reverse; what can it be when put in juxta-position with the Brobdignag project of the marine bridge of Bantry Bay, built in 60 feet depth of sea. That, we will venture to say, is a work which no practical engineer in the empire would recommend; and least of all would such a mode of construction as these commissioners approve, receive the sanction of a Smeaton, a Rennie, or a Walker.

Hard as we have already pressed these commissioners, a sense of duty we fear will compel us to press them harder still upon the next important branch of their system we have to discuss—the Dublin and Kilkenny Railway.

There is, we apprehend, but one restriction to which private enterprise should be subjected in the choice of railway lines, either in Ireland or in England; and it is this—no company ought to be permitted so to take possession of any line, as to prevent the further extension of it; and every internal line formed ought to be capable of such extension. This was the principle proceeded upon by the promoters of the company called the Great Leinster and Munster Railway, and the first extension of which is from Dublin to Kilkenny; and it is further worthy of particular remark, that their lines were planned more than three years ago, upon precisely such a general system as the commissioners are so favourable to. We cannot therefore conceal from ourselves that, in deciding against the Dublin and Kilkenny line, the commissioners are to a great extent deciding in the teeth of their own principles. We are assured that the utmost information respecting this railway was given to the commissioners; that the passage of the bill through Parliament was delayed in order to await their report, which was promised in May 1837; and that during a whole year not one word against the propriety or merits of the undertaking was intimated. When, however, the act had been read a second time in the House of Lords, it seems that the Government was told that it ought not to be allowed to pass, as the line in question would interfere with the plans of the commissioners; nevertheless the Government upon looking into the subject, felt the impropriety of preventing a large body of capitalists from executing a valuable public work, and the measure passed both houses, with certain clauses proposed by the Government for the purpose of limiting the progress of the undertaking for one year. This was a provision to give the commissioners full time to bring forward a case against the company. Have they done so? They permitted the year to expire: they allowed the company to acquire the fullest legal title to the line: and after that, they publish a report condemnatory of its execution. Thus what they were not strong enough in fact and reasoning to prevent, they have sought to damage and retard, by the expression of the most injurious, but in our view, the most unfounded opinions.

The report itself is evidently intended to be adverse to the Dublin and Kilkenny Company, and in humble conformity with all the suggestions of Mr. Vignoles, the engineer to an opposing undertaking. Yet might the directors of the Dublin and Kilkenny line refer to nothing better than that report for the most decisive evidence in their favour; for the report proves that while the districts traversed are such as will yield a profitable return to the capitalist, the routes proposed are such as will bring Cork, Limerick, and Waterford nearer to the metropolis than any other, and at the cost of making of as small an extent of railway.

The commissioners stated in their first report, and repeat in the present one—"That a line should be chosen in which the joint traffic of many places and districts should be made to pass to a great extent over a common line." In conformity with this very proper view, they express their object in proposing a system of railways for Ireland, to be—"to conduct the main lines through the counties where trade is most active and extensive." In order to carry out this principle, numerous returns have been obtained, the results of which are thus stated:—"That the largest stream is from Dublin to Naas, where it divides into three branches—the one by Carlow, Kilkenny, and Clonmel, to Cork; the other by Mountrath, Roscrea, and Nenagh, to Limerick; and the third, passing along the Grand Canal, is chiefly dissipated among the small towns on its banks, a small portion reaching Ballinasloe."

We think the commissioners ought to have perceived that it was precisely such opinions and facts as those here referred to, as being entertained by themselves, which must have guided the directors of the Great Leinster and Munster Railway in planning *their* system; for they occupy one of the above three great channels—namely, that to Naas, and thence by Athy and Carlow to Kilkenny, where their terminus is so placed as to be capable of easy extension to Cork by the shortest route (within four miles) near Cahir, which can be adopted. Striking, on the other hand, is the contradiction of the commissioners, who condemn this line, founded on their own views, and who have laid down a main line in opposition to it, which scarcely avails for Naas, and which does not pursue any one of those channels of intercourse which they have ascertained to be followed. They adopt the road to Cork by way of Cashel, a road of little traffic, and upon which only one coach (a mail) runs.

The two lines, that of the company and that of the commissioners, may be considered to diverge from each other at Sallens. Let us then look to the returns supplied by the report itself, to find the relative importance of the districts traversed as exemplified by the Post-office income of the different towns upon the Kilkenny line, 75 miles long, as compared with the first 90 miles of the other line.

Commissioners' Line.	£.	Company's Line.	£.
Rathangan	206	Naas	647
Monasterevan	256	Kilkullen	402
Portarlington	428	Athy	519
Mount Mellick	586	Carlow	1,441
Maryborough	436	Leighlin Bridge	341
Mountrath	444	Bagnalstown	388
Borris in Ossory	160	Goresbridge	366
Thurles	559	Kilkenny	2,112
	3,075		6,216

So far it appears that the proposed main trunk is *not* laid through those districts where "trade is most active and extensive."

Thinking that it might be worth the reader's while to learn the opinions expressed by the commissioners in reference to this line, and their objections entertained against it as a trunk, we propose to quote a passage or two: the grounds upon which private enterprise is to be checked, and existing rights invaded, will thus become apparent. The commissioners admit that the Dublin and Kilkenny line has been laid out with great judgment, and that its gradients are very favourable, but they strongly object to it as the main trunk line for the following reasons:—

"First, as a line to Cork, it is four miles longer to Cahir (a common point) than that by Maryborough; secondly, the communication from the city of Limerick to Dublin by any connexion with it, except by a branch line diverging at a short distance from Dublin, is quite out of the question."

These are the *only* grounds upon which the strong objections of the commissioners rest; and it is for the sake of these alone, that they are prepared to stop the influx of a very large capital into Leinster, and to violate privileges upon which an incorporated company has expended thousands of pounds. Such being the sum of their objections, it will hardly be supposed, that in the very next page but one, they confess that a branch from the Kilkenny line from Ballysax (29 miles from Dublin) will bring Limerick 12 miles nearer to Dublin than the branch proposed by themselves. They go on to say, "we are at the same time fully alive to the importance of a direct railway communication through the rich and populous valley of the Barrow, which contains the towns of Athy, Carlow, Bagnalstown, and Leighlin Bridge, and which would greatly facilitate the intercourse between the city of Dublin and the South-Eastern portion of the county of Wexford, including the towns of Wexford, Enniscorthy, and Ross." This is direct evidence against themselves, and it increases as we proceed, for the postage of the towns lying *upon* the line of communication through this valley more than doubles the postage of those lying *near* (even with the addition of Thurles), to that proposed by the commissioners. Nor should it be forgotten, that independent of the advantage it holds out to these most important districts, it brings Limerick *twelve* miles nearer, and Waterford *forty-four* miles nearer to Dublin than the commissioners' line—opens up the shortest route (within four miles) to Cork—and affords to Wexford that opportunity of connexion with the metropolis of which by the commissioners' line it would be altogether deprived. And here as well as elsewhere we may properly notice another contradiction:—the striking deficiency in their system, occasioned by the absence of a railway through Carlow, is so apparent, that the commissioners suggest a branch of 45¾ miles in length to supply that want; and yet in another part of their report, they state it as their opinion that Kilkenny and these districts are not of sufficient importance to justify a separate line. Thus they give a line, and also say the line is not justified.

Let us now offer a few remarks upon the subject of outlay. The difference in the cost of lines proposed by the Leinster and Munster Company, and those suggested by the commissioners for the connexion of Limerick, Cork, Waterford, and Kilkenny with Dublin, is thus given. By the commissioners' central system it may be effected by the formation of 265 miles of railway; and by the company's plan, that of the Great Leinster and Munster Railway, by the formation of 286 miles. The difference therefore is twenty miles: and for that, Limerick and Waterford will be brought so much nearer to Dublin; and all the great commercial and productive places, instead of comparatively barren districts, will be directly penetrated. But if to the preceding 265 miles, we add the branch of 45 miles suggested by the commissioners for the valley of the Barrow, instead of their proposed branch of 26 miles to Kilkenny, it is plain that "the system" has not even economy to recommend it.

The commissioners, we fear, attach too much weight to their simple opinion, at least they sometimes pronounce opinions for which the reader is utterly at a loss to supply reasons. Thus they talk of the important local advantages possessed by the main line, recommended by them in preference to the Kilkenny line, which again they deem "inconsistent with the general interests of the country, and directly opposed to those of several extensive and most important districts." Upon passages like these we can only observe that it is impossible to imagine what they can allude to.

The Post-office returns, quoted by themselves, show the relative importance of the districts proposed to be traversed; and the effect of the two lines as main lines is as follows:—

	Commissioners' Line.	Kilkenny Line.
Dublin to Limerick	125 miles.	113 miles.
„ Cork	166 „	170 „
„ Waterford	141 „	97 „
„ Kilkenny	76 „	73 „

Can it be necessary to add another word to those figures?

We now take up another line. The proposed railway from Limerick to Waterford, as described in several very important passages in the body of the report, is stated by the commissioners to pass through the towns of Tipperary, Cahir, and Clonmel, containing populations of 6,972, 3,408, and 18,000. But turning to the Atlas map and sections, we find that it runs 5¼ miles North of Tipperary, three miles North of Cahir, and one of Clonmel. The discrepancy here is so serious, that we find it difficult to suppose it unintentional. There is another circumstance connected with this line, which is rather serious. We have good authority for asserting that a map of this line, as originally projected by Nimmo and amended by Bald, engineers of considerable reputation, was delivered in to the commissioners in November 1836, but the line is *altogether suppressed in the Atlas map*, which professes to show "the lines laid down under the direction of the commissioners, and those proposed by private parties."

Another and a very marked fault in the commissioners' plan for a railway between Limerick and Waterford, which evinces either great ignorance or neglect of local wants, is that it runs half a mile North of the town of Carrick, without at all being connected with the harbour and navigation of the river Suir at that place. It would further appear, that the commissioners made no survey from Carrick to Waterford, either on the Eastern or Western side of the Suir, although in a plan upon which one would least expect to find them, they have given proposed rail lines on both sides of that river from Carrick to Waterford, but without any sections; the Eastern line copied from Nimmo's survey, and the Western copied, as we have reason to know, from the very document given in by the Waterford and Limerick Railway Company, which they have so strangely excluded from the Atlas map, and which, where obscurely described, they assert to have been "a railway as proposed by George Stephenson, Esq., civil engineer, about 1830." A more incorrect assertion than this last never was made. George Stephenson's report on the Waterford and Limerick Railway is now before us, and he proposes nothing of the sort. Neither does he in any one part of his report allude to any line of railway suggested by him or any other person to cross the Suir at Carrick, and run along the South-Western side of that river down to Waterford. This original idea is solely due to the recent promoters of the Limerick and Waterford Railway, under the title of the Suir and Shannon Junction Railway.

In the first place then, the survey made of the Limerick and Waterford Railway by the railway commissioners is incomplete; and in the second place, it carries the impress of being a very erroneous and inaccurate delineation, as shown by the following statement:—

In Part 1, Plan 4, 5, and Part 1, No. 11—Limerick to Waterford.

	M.	F.	C.
By the measurement on the maps, by the scale going along the line coloured yellow, East side of river Suir, we have	75	2	4
By the measurement figured on the map of the proposed railway, by the railway commissioners	73	0	0
Difference and consequent error	2	2	4
Again—			
A measurement on the maps by the scale gives, going along the line coloured blue, West side of Suir river	76	2	0
Figured length on the map of the proposed railway, by the commissioners	73	0	0
Difference and consequent error	3	2	0

Further, in the sections given of the survey of the Limerick and Waterford proposed railway by the commissioners, at 39 miles from Limerick, marked on the section to be found on map, part 1, plan 4, is a gradient of $\frac{1}{1667}$ for 2¼ miles;—while the heights which terminate

that slope, are marked respectively 278 feet and 307 feet; difference between these numbers 29 feet for 2¼ miles, which would give a gradient of $\frac{1}{400}$, instead of one in 1667, as figured on the section; (for $\frac{5280 \times 2\frac{1}{4}}{29}$ equal to 1 in 400). Again, the section states 3 feet 2¼ inches per mile, for 2¼ miles would give a difference of level of 7.0268 feet (for 3.194×2.2=7.0268); while the vertical heights on the same section, figured 278 and 307, would give a difference of level of 29 feet. Here is consequently another error in the levels, of 22 feet. We beg the commissioners' attention to these very gross errors both in the linear measurements and levels, affecting not only the character of the whole of their surveys, but involving more deeply that of the professional men whose names are appended to their maps and sections. Any person who knows a little arithmetic and the use of a pair of compasses, may in a few minutes detect these blunders; which are quite sufficient, we repeat, to ruin the character and reputation of the work. We beg to observe that plans and sections so defective, would be thrown out most unceremoniously by any committee of the House of Commons. Yet we have the Morning Chronicle and the Sun newspapers praising to the skies this work of the Irish Railway Commissioners. Good confiding Editors! How well-founded and trustworthy are the praises they bestow. These, we have further to observe, are only a few of the numerous errors which those who are competent to the task may detect with facility, both in the maps, sections, and levels of the commissioners' proposed railways through Ireland, executed under the authority of a royal commission. Nevertheless "my Lords have full confidence, from the character of the gentlemen appointed to form the commission, that their inquiries will be conducted in a satisfactory manner."

We have only one more remark to make upon the Waterford and Limerick Railway. The company's line was surveyed and reported on in the most favourable terms by Telford, George Stephenson, and Bald. Those gentlemen entered into a minute estimate of the cost and profits of the line as projected by Nimmo, and they calculated the returns at 12 per cent. The commissioners however set the line aside, and substitute another, the profit on which they estimate at two per cent.!

Thus far we have seen that the system of the commissioners gives one main line of railway to traverse the Southern part of Ireland, with proposed branches, and a corresponding one to the North and North-Western parts; but much of the centre of the island and the whole of the province of Connaught has been left without any line whatever. The great province of Connaught, or the fourth part of Ireland, has not been deemed worthy of having one single mile of railway present or future planned through it. The South and South-Western, and the North and North-Western, are the only favoured parts; but the great central and Western portions of the country, are abandoned to the very imperfect modes of intercommunication already existing, although private enterprise offers to complete more than one extended line. Now the province of Connaught is one of the most fertile, fruitful, and populous districts in Ireland; one too, much more capable of extended improvement than the sterile rubbish of the rocky mountains and transition slate districts of the remote parts of Kerry and Cork, which are patronised not for one only, but two most costly lines by the commissioners; which, moreover, as they themselves confess, will not pay. Is it not surprising, is it not most unreasonable, that the wild mountainous districts of the South of Ireland should be preferred to the magnificent, fertile regions of the great limestone districts of the centre West, so very much more abounding in profitable and improvable resources? The Western shores of Connaught are everywhere surrounded with fishing banks, on which are to be found an abundance of all kinds of fish, such as cod and ling. The fishing banks off Bofin Island and Achil Island; the fine harbours of Balinakill, Blacksod, and Broadhaven, present mines of inexhaustible wealth, and facilities for carrying on the deep sea fishery to a greater extent and with a richer success than does any other portion of the shores of the empire. If we look at these sources of maritime greatness, so easily convertible into great stores of national wealth; if we look at the fruitful limestone plains of Connaught, producing grain of all kinds in the greatest abundance, and in this respect possessing the especial qualities which the commissioners themselves describe as being the standard inducements for the construction of railways; if we look at the innumerable herds of cattle which are annually marketed at Ballinasloe, the largest cattle fair in Ireland; if we look at the positive richness of Connaught in fish, in grain of all kinds, in cattle, and in an extremely fertile soil,—we are left no room to doubt the fitness, nay more, the necessity of recommending to the inhabitants of so large and so valuable a district a railway to transmit the immense productions of her soil, and to carry back the imports which her population must consume.

To one point we must here request particular attention. Connaught is so peculiarly situated, that it requires a most difficult and dangerous navigation to sail from her shores with agricultural produce for the English market, either Southwards round Cape Clear, or Northwards by the Northern Channel. If a merchant vessel takes the voyage Northwards to Liverpool, she sails about 500 miles; if Southwards to Liverpool, 850 miles; while the distance across Ireland from the centre of Connaught to Liverpool is not more than 240 miles. This short statement shows clearly the great advantages a railroad running through the centre of Connaught to Dublin must confer, for it would provide the most direct and quickest transit for all kinds of commodities to the first market in the world. Such being the fact, we shall be anxious to learn the grounds upon which Government can propose to support a system which must have the effect of throwing back in the scale of improvement and civilization one of the richest quarters of Ireland, while a liberal share of the advantages of railway communication is proposed to be extended to all the other parts of the island. Something much stronger, we apprehend, and more sensible, will be required under this head of the inquiry, than the double and very imperfect plea put in by the commissioners when they assert, that the Grand and Royal Canals will be ruined if a railway passes through the centre of Ireland and Connaught, and that these canals are quite sufficient to answer all the traffic which Connaught requires. For in the first place, the commissioners ought not to have forgotten that there are only twelve miles of a canal in all Connaught; and in the next place, that there happens to be the finest river and canal navigation in all Ireland, running from Dublin to Limerick, nearly parallel with the line of railway which they insist upon giving to the country between those two cities. Then again, we have the Barrow navigation parallel on the other side; and in the North we find the Ulster canal, the Lagan canal, the Newry canal, and the Boyne navigation, all close to and competing with the commissioners' railway for that part of Ireland. From this embarrassment these Royal Commissioners, we think, will find it difficult to relieve their system; for what can be more monstrous than to intimate, as they do, that the various railways they have laid out and recommended for the South and North of Ireland will not injure the numerous canals and river navigation in those districts, while a single line of railway straight through the province of Connaught, in which there are only twelve miles of inland navigation, must utterly destroy the Grand and Royal Canals, which are not in Connaught at all? Again, we should be glad to know why a line has not been given from Ballinasloe, where the canal terminates, to Castlebar and Galway? The country is quite favourable, and entirely limestone, so much approved by the commissioners. Pray, has the Manchester and Liverpool Railway destroyed the traffic of the Duke of Bridgewater's Canal between Liverpool and Manchester? On the contrary, does not the canal carry more goods now, than it did before the railway was made? We go farther, and lay it down as a broad and incontrovertible principle, that by whatever means a country improves her industry, increases her trade, and augments her capital, her navigable rivers, navigable lakes, and still-water canal navigation, must also partake of the general progress of commerce and intercommunication.

In winding up these observations, we feel it necessary to observe that we have only written them after a full consideration of the subject in its various details and bearings, with a most sincere desire for the good of Ireland, with the best regard for the railway interest of the empire generally, and with no feelings personally unfriendly in the smallest degree to the commissioners. Having given in a former number a list of the railway companies in course of formation in Ireland when the commission was appointed; and having shown that the great object contemplated by Parliament and the Government in permitting the commission to issue, was the aid and facilitation of the enterprises designed by those very bodies; we have left the reader no room to doubt or dispute the final conclusion to which we have led him, and which affirms that the commission has proved a signal and total failure,—that it never will be acted upon,—or that if such an attempt be made, the most ruinous consequences must follow. The compliments which have been so freely lavished upon the commissioners by some of the ministerial papers, and the acknowledgments which have been tendered for the statistical information combined in the report, are altogether beside the real question at issue; for the estimates furnished by the various companies which the report attempts to put down, would have gone near to give us the same knowledge, and very nearly to the same extent and in the same degree. As it is, the inquiries of the commissioners are not available for the most obvious uses. For Parliamentary proceedings it will be impossible to rely upon them, because

they have been thrown into new and arbitrary forms, with the view of illustrating the commissioners' system, instead of furnishing, according to the prescribed usages of either house, the proper means of applying to the different lines the evidence indispensably required to sustain them. As to the main suggestion of the commissioners, the *summum bonum* of the report, and grand finale of the inquiry, it is so palpably weak and mischievous, that we shall not waste a word upon its refutation. We shall content ourselves with announcing the proposition, and leave it to gain friends as it can,—it is that the *making of all railways in Ireland, as proposed by Pierce Mahony, Esq.,* shall be intrusted to only one body of capitalists, who shall be instructed by Government and largely supplied with public money, and that this body in return shall be compelled to make all the suggested lines, good and bad, setting the profits of the one against the losses of the other.* To the jobbers and monopolists who infest the court-yards of Dublin Castle this will doubtless appear a cheering prospect, and wise counsel. By men of good sense, however, who happen to know the world and the value of money, the upshot of this expensive commission will be regarded, we believe, in a very different light, and repudiated with very little respect. For ourselves, we do not see what better step ministers can take in this matter, than to go back to the point all parties stood at in 1836, when the commission issued, and leave the different joint-stock companies to proceed in the usual Parliamentary manner as they shall respectively see fit.

In order to verify what we have said already relative to the errors which prevail throughout the Plans and Sections, we subjoin a statement of such as we have had time to detect.

PART I.—SOUTH OF IRELAND.

	M.	F.	C.
Plans Nos. 1, 2, 3, 4, and 5, the figured length given on the Plans from the Zero of Mileage, near Dublin, to Limerick	125	4	0
The length measured by the scale on the Map from the Zero of Mileage, near Dublin, to Limerick	123	6	0
Difference or error	1	6	0
The figured length on the Plan of Railway from Zero of Mileage, near Dublin, by Limerick to Tarbet	160	0	6
The length of ditto measured by the scale on the Maps	158	0	6
Difference or error	2	0	0
Plans 4, 5, and 11 of the proposed Railway from Limerick to Waterford, measured by the scale along the line coloured yellow, East side of River Suir	75	2	4
The figured length on the Plans of ditto	73	0	0
Difference or error	2	2	4
On the same Plans, measured by the scale along the line coloured blue, West side of River Suir	76	2	0
The figured length on the Plans of ditto	73	0	0
Difference or error	3	2	0

In Plan No. 7 of Railway from Cahir to Mallow, there is a difference of two miles, if measured by the scale, of that portion between the figured distances 128 and 152 miles.

In Plan No. 8 of Railway from Mallow to Cork, and Blarney to Inchy-geelagh, there is a difference of two miles more, in measuring by the scale along the line, and the figured distances of that portion between the figured distances 168 to 195 miles.

In the Index Map, the length from Dublin to Limerick of the proposed Railway measures 120 miles; the figured length on the Plans 1 to 5 from the Dublin Post-office to Limerick is 128½ miles, making a difference of 8½ miles.

The scale on the Index Map is very incorrectly graduated, and also many of the scales attached to the diagram sections;—they vary from 5 to 10 feet.

Section Dublin to Limerick (Plan No. 2, Diagram Section).—A gradient is given on the section, of 1 in 2164 for 4½ miles; the vertical heights terminating this gradient on the section are 255 feet and 256 feet. There must be an error here of 10 feet, for $\left(256 - 255 = 1.\ \frac{5280 \times 4\frac{1}{2}}{1} = 23760\right)$. This would give a gradient of 1 in 23760 feet, and not 1 in 2164, as figured on the section; and even allowing the error of 10 feet, it would not be a gradient of 1 in 2164, but 1 in 2160.

In No. 3 Diagram, Section Dublin to Limerick, there is a gradient of 1 in 7920 for 4¼ miles; the vertical heights terminating this gradient on the section are 409 feet and 406 feet; this would give a gradient of 1 in 7480, and not 1 in 7920, as figured on the section; for $\left(409 - 406 = 3.\ \frac{5280 \times 4\frac{1}{4}}{3}\ 7480\right)$. On the large section, the gradient is figured 1 in 7458, which is also wrong.

There are several other errors in the sections of the proposed Railway from Dublin to Limerick; but enough is here shown to prove how inaccurate and defective they are.

No. 4, Section Limerick to Clonmel. The second last gradient in this section is stated to be 3 feet 2⅓ inches per mile, or 1 in 1667 for 2⅕ miles; the two vertical heights terminating this gradient are 278 feet and 307 feet, this would give a gradient of 1 in 400, and not one in 1667 $\left(307 - 278 = 29.\ \frac{5280 \times 2\frac{1}{5}}{29} = 400\right)$. If it be a rise of 3 feet 2⅓ inches, as stated in the section, the difference of level would be 7 feet ($3.194 \times 2.2 = 7.0268$ feet); now taking the two verticals given on the section, of 278 feet and 307 feet, the difference of level would be 29 feet in place of 7 feet;—this is a most serious error as regards the levels.

No. 5. On the continuation of the same section another error exists, although not of so serious amount as the last. The section states—"This gradient of about 16 feet per mile, or 1 in 330, to be obtained on further examination." The two verticals terminating this gradient on the section are respectively 142 feet and 309 feet; this would give a gradient of 1 in 339.88, $\left(\text{for } 309 - 142 = 167.\ \frac{10.\frac{3}{4} \times 5280}{167} = 339.88\right)$ and not 1 in 330, as figured on the section.

PART II.—NORTH OF IRELAND.

	Miles.	Yards.
Plate 33, Railway from Dublin to Armagh; length figured on the Section	85	880
Measured length by the scale	84	1540
Difference or error	0	1100
Plate 34, Railway from Navan to Enniskillen; the first horizontal distance figured on the Section at Navan is	1	1750
The length, measured by the scale, is	1	750
Difference or error	0	1000
The horizontal length of the terminating gradient on the Section at Enniskillen, measured by the scale, is	2	880
Figured length	1	910
Difference or error	0	1730
Amount of the total figured length on the Section from Navan to Enniskillen	68	415
Amount of detailed length on the Section from Navan to Enniskillen	66	415
Difference or error	2	0

In the Diagram of Clivities there are the following errors:—

	Gradient on small Section.	Gradient on large Section.	Gradient obtained by calculation.
Plate 8. Dublin to Armagh	1 in 2086	2091	2054
Plate 20. Navan to Enniskillen	1 in 736	736	731
"	1 in 4320	4320	4595 and 4628

Diagram Section, from Dublin to Armagh, of maximum gradients not exceeding 1 in 180, there are the following errors. The corrected column contains the gradients calculated by ourselves; by dividing the length by the difference of the height at the extremes of each gradient as marked on the sections.

* It appears clear, after some warm disputing which has only confirmed the charge, that the Report, as just printed, contained rather a significant note at page 93, which has since been suppressed. We give a copy of it, as we saw it in a printed copy of the Report itself; and we shall only observe upon it, that reading in connexion with it the concluding chapter of the Report to which it was appended, there certainly does appear reason to think that the commissioners intended to indicate, to the prejudice of other competitors, the body of capitalists represented by Pierce Mahony, Esq., as those which ought to have the benefit of the monopoly they have recommended.

"So long back as December 1836, a body of capitalists, represented by Pierce Mahony, Esq., after an interview with the chief secretary, communicated to the commissioners a readiness to undertake any lines to the South-West that they should recommend, and offered to contribute 1,000*l.* towards making the necessary survey; and in May last, 1838, they repeated their desire on understanding that the commissioners' report would be very shortly after presented to Parliament.

"They explained the cause of their not having pressed on Parliament any views of their own; as they considered that such proceeding must have tended to embarrass the execution of the propositions that should be made by us.

"This is no doubt true, and we must think that these gentlemen deserve credit for their forbearance.

"We have added the two letters to our appendix."

Plate 33.—Dublin to Navan.

Gradient on Section.			Gradient corrected.
1 in 555	-	-	1 in 560
200	-	-	204
660	-	-	669
396	-	-	401
587	-	-	555
366	-	-	204
330	-	-	315
330	-	-	274
705	-	-	540
187	-	-	188
193	-	-	196
232	-	-	234
360	-	-	312

Plate 33.—Carrickmacross to Armagh.

1 in 207	-	-	1 in 209
190	-	-	192
270	-	-	268
272	-	-	275
433	-	-	443
535	-	-	548
268	-	-	275
300	-	-	296
185	-	-	192
229	-	-	232
359	-	-	368
303	-	-	304
2190	-	-	2235
214	-	-	201

Plate 33.—Navan to Carrickmacross.

1 in 199	-	-	1 in 200
261	-	-	264

Gradient on Section.			Gradient corrected.
1 in 936	-	-	1 in 945
342	-	-	340
344	-	-	342
330	-	-	332
193	-	-	195
366	-	-	376
328	-	-	331
262	-	-	267
350	-	-	363

Plate 34.—Navan to Enniskillen.

1 in 340	-	-	1 in 243
296	-	-	295
210	-	-	214
320	-	-	326
320	-	-	326
997	-	-	815
219	-	-	203
806	-	-	801
214	-	-	187
209	-	-	196
179	-	-	178
391	-	-	399
180	-	-	179
183	-	-	178
182	-	-	183
211	-	-	120
180	-	-	179
203	-	-	204
186	-	-	200
184	-	-	185
5735	-	-	5235
318	-	-	591
390	-	-	300
268	-	-	2415

REVIEWS.

A Practical Treatise on Railroads, and Interior Communication in general: containing numerous Experiments on the Powers of the improved Locomotive Engines; and Tables of the comparative Cost of Conveyance on Canals, Railways, and Turnpike Roads. Third Edition, with additions. By Nicholas Wood, Colliery Viewer, Member of the Institute of Civil Engineers, &c. London: Longman and Co.; 1838.

(Second Notice.)

It is now very generally admitted that Railways must shortly become the great highways of the kingdom; and it consequently becomes an object of national importance, to consider the best modes both of constructing and of working them. It appears to us highly desirable that they should all be governed by one law, that all their regulations should be uniform; which we conceive would save much inconvenience and annoyance to the public. No part of the system assuredly requires more full consideration than the gauge for laying the rails, which in consequence of the unfortunate relinquishment of the standing order of parliament requiring a uniform gauge,—a relinquishment that we lately deplored, and shall not soon cease deploring,—varies at present from 4 ft. 8½ in. to 7 ft. If this system,—or rather, this want of system,—be allowed to continue, and every company be left to adopt its own favourite gauge, we fear that the greatest confusion will overspread the whole, and serious inconvenience be the result to all parties concerned. This will be the most sensibly felt at large towns, such for instance as the Metropolis, where many lines come in from various quarters as to one common centre. In London it seems to be most essential that the various railways should all unite, that they should all be brought more into the heart of the city, and be made also to communicate with the Thames. We are indeed aware that there exists a strong opposition to the introduction of the metropolitan lines any further into town,—especially on the part of the Corporation of London. This powerful body will however probably be convinced ere long of the necessity of such a measure; for if it be not adopted, they will assuredly find many wholesale dealers and merchants removing their warehouses to the vicinity of the various railway termini, in order to save time in the transaction of business, and labour and expense in the carriage of goods. It now occupies, for instance, as much time to go from the Royal Exchange to the terminus of the Great Western Railway, as at the average rate of travelling on that line is proposed to be consumed in steaming from Paddington to Maidenhead.

Regretting as we do, that the opportunity should have been lost of carrying on the railway system from the first on a uniform and consistent plan, we think that much might yet be accomplished towards this very desirable object. For this end we would recommend as a highly advisable measure, the immediate formation of what might be termed a Railway Congress, consisting of one Director and the Engineer of each line. They should meet occasionally for the consideration of such points as may appear of mutual advantage; as the regulation of the traffic, the engines, and the general mode of conducting the business of the lines. Their decision should be binding on all the companies; and when necessary they might recommend to parliament bills for the regulation of railways; which from such a body would come supported by the high authority of extensive and practical experience. We would further suggest the raising of a fund by periodical contributions from each company proportionate to their respective capital, to be at the disposal of the Congress for the purpose of making experiments on subjects of mutual importance, such as the best form of rail, the most advantageous construction of locomotives, passengers' and goods-carriages, signals, &c. For these important purposes, there is at present no proper provision; each company has to form its own experience, except so far as it can avail itself of the experiments of its predecessors. Thus by insulated efforts capital is squandered, which by judicious combination might be accumulating an immense fund of useful experience to the mutual advantage of all the subscribing parties. We throw out these suggestions, merely as hints to excite to further reflection; and we are firmly convinced, whatever be thought of our suggestions, that the subject itself is deserving of the most attentive consideration.

But all this time, Mr. Wood is waiting for our "second notice;" we beg his pardon, and will at once return to the consideration of his book, only reminding him by the way, that it was he who furnished us with the text for our digression.

There are perhaps few branches of practical science that require in the student a more complete and extensive knowledge of the principles of Mechanics and Mathematics, than railway engineering;—so many and various are the circumstances which require to be taken into consideration, and the omission or inaccurate appreciation of which would lead to erroneous and often ruinous results. Of the importance of these branches of knowledge, Mr. Wood seems fully aware; and he has accordingly introduced into his work several valuable algebraical formulæ for the assistance of the engineer in his calculations.

Chapter VI. is entitled *Description of the different kinds of Motive Power used on Railroads, and Disposition of the Road for their application.* It treats first of horses, then of self-acting planes, afterwards of various kinds of planes worked by stationary engines, and lastly of locomotives. Under this last head, which is by far the longest, will be found much interesting information respecting the progressive improvements in the construction of locomotives, detailed accounts of various experiments tried from time to time, and tables of the dimensions &c. of engines manufactured by Messrs. Stephenson, Hawthorn, and others.

The Friction and Resistance of Carriages on Railroads is investigated in chapter VII. This subject was little understood till M. Pambour published to the world the results of his valuable experiments on the Liverpool and Manchester line. Of this information, and of the valuable experience also of several eminent engineers, Mr. Wood has made use in this part of the work. The following table is the result of some experiments made by Mr. George Rennie in 1825, on the friction of axles with different unguents.

TABLE XII.

Insistent weight in lbs.	Resistance in parts of the weight, and kind of unguent employed.				
	Tallow.	Oil.	Hogslard.	Soft Soap.	Anti-attrition.
56	—	$\frac{1}{37}$	$\frac{1}{34}$	$\frac{1}{28}$	—
112	$\frac{1}{33}$	$\frac{1}{33}$	$\frac{1}{36}$	$\frac{1}{32}$	$\frac{1}{14}$
224	$\frac{1}{36}$	$\frac{1}{32}$	$\frac{1}{25}$	$\frac{1}{37}$	$\frac{1}{24}$
336	$\frac{1}{40}$	$\frac{1}{20}$	$\frac{1}{14}$	$\frac{1}{35}$	$\frac{1}{32}$
448	$\frac{1}{40}$	$\frac{1}{18}$	$\frac{1}{16}$	$\frac{1}{35}$	$\frac{1}{33}$
560	$\frac{1}{40}$	$\frac{1}{19}$	$\frac{1}{11}$	$\frac{1}{37}$	$\frac{1}{38}$

The oil and hogslard show, that the maximum effect took place with light insistent weights, gradually diminishing in effect, or showing an increase of resistance, as the insistent weight was increased; while the contrary is

the case, with the more viscid unguents of soft soap, and the anti-attrition mixture.

It would not, perhaps, have been necessary to have gone so much into length on this subject, had not all these experiments proved, that the practical result, as displayed in the modern built carriages, is, that the friction of attrition on their axles is greater than that of other machinery of a like nature. Either the axles and bearings are so proportioned, that with certain insistent weights, a maximum effect is not produced; or, that the unguent employed is of such a nature, as not to prevent the contact of the metals, or that it is more viscid than necessary.

When such large sums are expended, to make the gradients of the lines of railway moderate, it is equally important to diminish the resistance of the carriages, by diminishing the friction.

Coulumb found the friction, with hogslard, one-twenty-seventh of the weight; Tables VI. and VII. show it the sixty-second and sixty-sixth parts; Southern, the fortieth; Mr. Rennie, with tallow, the fortieth, and with oil the thirty-seventh; the experiments, with the common coal waggons, in Table V., the twentieth; the experiments on the Darlington railway, the twenty-first; while the experiments with Mr. Stephenson's carriage, on the Liverpool and Manchester railway, shows it equal to the eleventh part of the weight.

In the two latter cases, the ratio of the diameter of the axles to that of the wheels, was as 12 : 26; therefore, the aggregate resistance is less in the latter than the former; for 21 + 12=252, and 11 + 26=286th part of the weights.

The insistent weight in the former was about 100lbs. per square inch of bearing, and in the latter, more than 250lbs. per square inch; experiment giving 90lbs. per square inch, when the effect is a maximum.

It appears, therefore, that the weight of the carriage, and area of bearing surface on the axles of a carriage, should be such as not to subject the latter to a greater pressure than 90lbs. per square inch; and, having determined this, it then becomes a question, how the axle is to be proportioned, to obtain this pressure.

The experiments made on the single axle, show the effect diminished, about fifty per cent. with the weights, 2465, and 1331, when the length of the bearing is doubled; *as, therefore, the resistance will be increased, in the direct ratio of the increase of the diameter of the axle, and only one half* in the terms of the *length; it appears that, in calculating the size of the axles, to obtain the necessary area of bearing surface, the length should be equal to twice its diameter, and that the area should be such as not to subject it to a greater insistent weight than 90lbs. per square inch.*

Taking the result of the common coal waggon bearings as a standard, it would appear, that in practice, we may calculate on the friction upon the axles, as the twentieth part of the weight, or f'=·05, and making f=·001; we have the force, P, necessary to drag a carriage on a level railway

$$P = \frac{W}{f} + \frac{W'}{f' \frac{d}{D}}$$

The next chapter is devoted to the *Friction of Ropes used by fixed Engines on railroads.*

The ninth chapter, entitled the *Theory and Application of the various kinds of Motive Power used on Railroads,* treats at great length of the various powers before described in chapter VI. Under the head of *fixed engines,* it details the results of several additional experiments. Some errors have crept into the calculations in this chapter, which we recommend to the author's notice, with a view to their correction. Here, as in chapter VI., locomotive engines deservedly claim by far the greatest share of the space allotted to the subject. Mr. Wood has here again availed himself of the valuable experiments of M. Pambour, from whose work he has extracted rather largely; he also makes use of such other experiments as he has been a[ble] to obtain. The construction of locomotives is however still in [its] infancy; it is well known that with the same work one engine will last twice as long as another by the same maker; and so many defects still exist in the machinery, that much more information and much longer experience will be necessary to our attaining to a perfect construction of the engine. The great and increasing demand is daily bringing out improvements, which will no doubt by degrees increase the efficiency, promote the durability, and diminish the cost of the machine. Several important improvements have been adopted within the last two years; and if we are to believe the accounts given by the Americans of their performances in this line, they appear to excel us in the power of engines for ascending inclined planes. Some experiments have been recently published, performed by an engine built by Norris of Philadelphia. The account is given below,* but we should very much like to see it confirmed by some eminent English engineer, as well as the American and Austrian ones whose authority is cited. For if Mr. Norris's engines *really do* what is stated of them, it is most desirable that we should make ourselves acquainted with their construction.

In four following chapters, Mr. Wood has collected some valuable information relative to the comparative cost of different modes of conveyance. After giving various calculations founded on the experience gained on several railways, he brings forward the following results.

Having, therefore, determined the expense of conveyance by locomotive power on railways, both on public railways, for the conveyance of general merchandise, minerals, and passengers; and, likewise, of minerals alone, on public railways, we now give the result in a tabular form, taking the cost on the London and Birmingham railway for the expense of haulage.

TABLE XIV.

Table of the cost of conveyance of goods and passengers by locomotive engines, on railroads.

Rate of speed in miles per hour.	Resistance per ton in lbs.	Cost of haulage per ton per mile.	Cost of carriages per ton per mile.	Cost of conveyance per ton per mile.	Charges for conveyance per ton per mile.	Remarks.
		d	d	d	d	
8	8·5	0·375	0·19	1·065	1·065	Export coals.
					1·566	Landsale coals.
12	8·5	0·5	0·227	2·138	3·5	General merchandise.
20	8·5	0·25 per passenger	0·206	0·675 per passenger	1 to 1½ per passenger	—
		1·73 per ton		2·855 per ton.	12·87 per ton.	—

In this table, a very great difference of cost will be observed, between the conveyance of coals, and general merchandise; the latter amounting to 2·138*d.* per ton, per mile, while the average of the former is 1·315*d.* per ton per mile. This arises from several causes. On public rail ways, for general merchandise and passengers, when the latter are conveyed at a higher rate of speed, it is almost, if not entirely unavoidable, to prevent the trains with goods partaking, to a certain extent, of a rate of speed beyond that of the most economical; the trains are likewise obliged to be set off, at certain stated periods, whether they are fully loaded or not. We see that the trains, with general merchandise, upon the Liverpool and Manchester railway, from which the above cost is deduced, average only 17·2 tons gross load; upon the Stockton and Darlington railway the average load is 63·6 tons, the former travelling at the rate of twelve to fifteen miles an hour, and the latter eight to ten miles an hour. On a reference to § 4, Art. 7, Chap. IX., it will be seen, that the relative economy of these engines travelling at different rates of speed, and with loads proportioned to the rate of speed, is in the ratio of the resistance of the gross load taken, including the engine, the relative resistances of these loads will be as 66 : 83.

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* "The performances of my engines," says Mr. Norris, "on the inclined plane at the Schuylkill have exceeded the very best performances of the best English engines by *seventy per cent.*, as will be seen on comparison. This plane is 2,807 feet in length; ascent in that distance 196 feet; equal to a grade of 369 feet rise per mile, or one foot rise in 14·3 feet.

1st. July 9, 1836.—The George Washington, weighing 8,700 lbs. on the driving wheels, ascended to the top in 2 minutes 1 second, dragging up a load of 19,200 lbs., and with the same load descended, stopping frequently in the descent, and moving up and down for the space of fifteen minutes.

2d. July 19, 1836.—The same locomotive made another performance in the presence of several scientific gentlemen from the city of New York, who visited Philadelphia for the express purpose of witnessing what they had not believed. Messrs. D. K. Minor and G. C. Schaeffer, the editors of the New York "American Railroad Journal," were present. They came doubting, and on arriving at the foot of the plane, with a large party of Philadelphians, they still doubted the practicability of overcoming so steep an elevation. Anxiety was on every face—a bolder attempt had never been made. A load of 31,270 lbs. was then attached, consisting of the tender with fuel and water, two passenger cars, and 53 passengers. The engine was started at the base, and reached the summit in 2 minutes 84 (?) seconds. I quote the editor's own words:—'The enthusiasm of feeling manifested cannot be described; so complete a triumph had never been obtained. The doubts that had been entertained by some, and the fears of others, were dispelled in an instant. The eager look that settled upon every one's face gave way to that of confident success, while all present expressed their gratification in loud and repeated cheers.'

The performance was witnessed by fifty-four gentlemen of science, and of the highest respectability, whose signatures, in my possession, attest the fact. This performance, made nearly two years ago, has exceeded by 70 per cent. any other performance in Europe or America to this day. I have in my possession duly authenticated documents to prove the above, as well as several other performances on the same plane, equally extraordinary. Several of my machines have been kept on duty for fifteen days in succession on the said plane, doing all the duty of the stationary engine, while the same was under repair, dragging up at each trip never less than 25,000 pounds."

The cost of conveyance on the Stockton and Darlington railway is ·4*d*. per ton, per mile; therefore, as ·4 : 66 : : 83 : ·5, which is nearly the cost of the Liverpool engines.

The above calculation will account for the increase of expense of the motive power; but this only amounts to ·125*d*. per ton, per mile, whereas the difference is ·873*d*., leaving ·748*d*. per ton per mile not accounted for. We observe, that the expense of carriages is greater for general merchandise than for coals and minerals; but the great difference exists in the expense of conducting the traffic of general merchandise upon public railways, in receiving and storing, loading and unloading goods, and in the expense of the necessary attendants; none of whom are required for coals and minerals, which are generally loaded and unloaded by the proprietors. The expense of conducting the traffic, including the above enumerated charges, amounts to 1*d*. per ton, per mile, upon the goods, actually subject to the above charges; or ·460*d*. per ton, per mile, upon the aggregate traffic on the Liverpool and Manchester railway. This expense, together with several other items, which will be seen on examining the particulars under the respective heads of charge, incidental to a public railway, with a mixed traffic; will account, satisfactorily, for the difference between the cost of conveying merchandise on such railways, and coals or minerals on railways more particularly applicable to the conveyance of such articles.

It is, however, a question of some importance, how far public railways, with a mixed traffic, and on which passengers are to be conveyed at high rates of speed, are applicable to the economical conveyance of heavy goods or minerals. We have before remarked, that the example of the cost of the Liverpool and Manchester railway, must be taken as being beyond what may reasonably be expected to be the cost of future railways. Taking, however, the cost of that railway, we find the expense of motive power ·55*d*., of maintenance of the railway ·307*d*., and the cost of upholding waggons ·227*d*., altogether 1·084*d*. per ton, per mile. These are the direct expenses, any traffic on which dues above these sums can be charged, will operate to diminish the general or constant expenses of the establishment, and will, therefore, be profit, with the exception of a portion of expense of attendants, &c.; if we take the general charges the same as upon the Stockton and Darlington railway, or at ·100*d*. per ton, per mile, we have the whole expense equal to 1·184*d*. per ton, per mile.

We see, therefore, that the entire cost of conveying minerals or coals along a public railway, with a mixed traffic, will be 1·184*d*. per ton, per mile; without reckoning any charge for interest of capital, or profits, and taking the expense of the Liverpool railway as a standard; and if we take the contract price for haulage, upon the London and Birmingham railway, this will be reduced to 1·134*d*. per ton, per mile. We have already explained, that the expense of the motive power is increased by the diminished load taken at each trip, that the cost of maintenance of the Liverpool railway is greater than may be expected in future; we may, therefore, state, generally, that the direct expenses, exclusive of loading and unloading, and of conveying coals or minerals along public railways, will amount to about 1*d*. per ton, per mile; and that any charge beyond that, will assist in reducing the general expense of the necessary establishment of the railway, for conducting the other traffic.

Chapter XIV contains a short account of the *Construction of the Great Western Railway, and the Locomotive power to be used thereon*;—an interesting subject, which in a future edition of Mr. Wood's work will claim a larger space, to exhibit the results of the various great experiments which are in course of trial upon that line.

An Appendix subjoined to the volume contains much useful information, statistical, experimental and technical, which will amply repay the careful attention of the student.

And here must we close our notice of Mr. Wood's valuable work; our extracts have already run to considerable length, or we should be glad to add a few more. We think however, sufficient samples have been brought forward, to convince the reader of the justice of our opinion, already more than once expressed, in favour of the work before us.

A Treatise on Roads; wherein the Principles on which Roads should be made, are explained and illustrated by the Plans, Specifications, and Contracts made use of by Thomas Telford, Esq. on the Holyhead Road. By the Right Honourable Sir Henry Parnell Bart. Hon. Mem. Inst. C. E. Second Edition. London: Longman & Co., 1838.

It has been said that the English are a nation of Merchants, and of Merchant Princes, whose immense wealth has been obtained by the enterprize which characterizes their commercial relations. In each department of business, the most lively energy is constantly maintained; and so well are its arrangements organized, that as in an immense hive, each member of the community while providing for his own subsistence, is promoting the general good.

To trace the causes of the commercial prosperity of Great Britain, we must look elsewhere than to her naval and military power; which, so far from their having been, as in the case of many other nations, the primary cause of her greatness, have played but a subordinate part in the great drama;—we must look to the spirited manner in which the arts and sciences have been cultivated by her sons, and to the many, great, and important improvements introduced by their persevering and successful enterprize. Foremost among these, appears to stand the continued succession of improvements in Internal Communication. And although, since the introduction of railways and locomotive steam power, we have ceased to be satisfied with less than the velocity of the eagle; yet we should never lose sight of the fact, that this modern innovation has resulted from the increased wants of society, which themselves originated in the improved and excellent state of the common high roads of the kingdom. The commercial prosperity of the country dawned with the improved system of road-making; and to such roads and means of conveyance a debt of gratitude and respect is due, however lightly they may be esteemed by the exclusive admirers of the new and astonishing velocity of modern locomotion.

These thoughts were suggested to our mind by the appearance of a second edition of Sir Henry Parnell's excellent Treatise on Roads;—a work that should be not only in the hands of every person in any way connected with the highways of the kingdom, but also on the shelves of every public library as a standard book on a subject of universal and permanent interest. The new edition has been improved by the addition of a chapter on carriages, and several new paragraphs and notes, from which we shall proceed to make some extracts.

But first we must observe that although on the whole we highly approve of the work, there are passages which we little expected to see written by an author of such eminence as Sir Henry Parnell. We fear that his long experience of turnpike roads, and the credit which he has deservedly gained both in promoting the formation of the great Irish road by Holyhead, and in chronicling its history, have in some measure unfitted him for coming to a sound and impartial judgment of the merits of the new railway system, which threatens in great measure to supersede his favourite means of locomotion. Thus do we account for his comments on "Iron Railways," which appear to us somewhat behind the age, and in which we do not suppose many merchants or men of business will be found to concur.

The uses and advantages of iron railways with locomotive engines, have of late been so fully explained in several works of great ability, that it is not necessary to repeat in this, what was stated respecting them in the last edition.

The eagerness which was so generally displayed by vast numbers of persons to give credit to the representations of the great profits to be realised by railway shares, gave so much encouragement to all those adventurers, who looked to derive immediate advantage from railway projects, that acts of parliament have been passed for railways in every part of the kingdom. The experience, however, which has been gained from those already completed, and from the enormous expense incurred on those which are in progress, has led to a general opinion that there is little probability of more than a few of these works affording any ultimate return for the money expended upon them.

The heavy expense which is proved by experience to be unavoidable in keeping the railways and engines in repair, where great speed is the object, will in numerous cases soon make it evident that no dividends can be paid to the shareholders; and the cheaper method of using horse power will be adopted. This has recently happened on a railway, where, although the traffic on it was very considerable both of goods and passengers, the cost of using steam power absorbed nearly all the money received; and accordingly, a case having been made out by an eminent engineer to show that if horse power were employed the traffic would afford a dividend, the use of steam power was discontinued, and the result has proved the change to be completely successful.

What seems to have been the great error on the part of those who have introduced the modern railway system, was making excessive speed the main object of it. It is this which has led to the enormous expense, 1st, as to the gradations of the lines; 2dly, as to the strength of the construction of rail ways; and 3dly, as to the engine. But the attaining of the speed of 25 or 30 miles an hour, at such an enormous expense, cannot be justified on any principle of national utility. The usefulness of communication, in a national point of view, consists principally in rendering the conveyance of all the productions of the soil and of industry as cheap as possible. This keeps down the prices of food, the prices of raw materials, the prices of finished goods; and thus increases the consumption of all productions, the employment of labour and capital, and generally the national industry and national wealth. But a speed of 10 miles an hour would have accomplished all these purposes, and have been of great benefit to travellers, while it could have been attained at from one-half to one-third of the expense which has been incurred by the system that has been acted upon. It is no doubt true, that travelling at the rate of 25 or 30 miles an hour is personally very convenient, but how it can be made to act so as to contribute very much to the benefit of the country at large, it is not easy to discover. Economy of time in an industrious country is unquestionably of immense importance; but after the means of moving at the rate of ten miles an hour is universally established, there seems to be no very great advantage to be derived from going faster.

Sir Henry might just as well have argued, that because excellent

sailing vessels had been established between London and Edinburgh or Paris, there was no necessity for introducing steam-boats on these stations;—or that because some of the finest sailing vessels in the world were plying on the line from England to America, there was no advantage to be gained from steaming across the Atlantic. Very few persons we conceive,—excepting perhaps here and there a timorous old maid,—will agree with the author that it is no very great advantage to be able to travel from London to Liverpool in six or seven hours, or from London to New York in fourteen days. But we have interrupted Sir Henry in his observations; he proceeds thus—

The use of steam power and the practice of keeping up an excessive rate of speed, has necessarily led to high charges for carrying passengers and goods. A slower rate of speed would, by diminishing expense, admit of the charges being moderate, and in this way the national interests would be best promoted. The object in making railways, ought from the beginning to have been, the reduction of the cost of moving passengers and goods to the lowest possible limit, and not excessive speed. This would have made the money applied to railways go much farther in extending them over the face of the country; the risks of accidents would have been almost wholly avoided; while the charges for travelling and transporting goods would have been considerably less. It is however right to admit, that if the raging passion for excessive speed had not been gratified, subscribers probably would not have been found for forming railway companies, and what was really useful and necessary in substituting railways for common roads would never have been accomplished. The public, in fact, are alone to blame for the immense waste of money which has taken place in forcing an excessive rate of speed, and in producing that superfluity of embellishment and grandeur which is to be seen on all the railways.

The chapter on *Repairing roads* contains the following note by Mr. M'Neill, describing an experimental "road made partly with broken stone, and partly with pieces of cast metal, laid on over a sub-pavement of rubble stone."

This plan has been lately tried on a part of the Holyhead Road between London and Birmingham, and appears to possess some important advantages, which however can only be ascertained with certainty by a trial on a more extended scale, and in a situation where there is a much greater thoroughfare of horses and carriages.

The plan simply consists in laying pieces of cast metal on the surface of the road, previously well constructed in the manner recommended by Mr. Telford, and adopted in all the new works on the Holyhead Road; that is, with a rubble pavement of large stones, covered with six inches of good hard broken stone. This layer of stone should be laid on in two successive operations; the first coat should not be more than three inches thick, and should be kept constantly raked until it becomes nearly consolidated; the second coat should then be applied, and raked in very carefully the moment a carriage track appears in it. When this coating becomes consolidated, so that a carriage can pass over it without leaving a rut, the iron may be applied. This may be done by a labourer. He should be provided with an iron instrument similar to a marline spike, and about twelve inches long; the upper six inches should be round, and the lower six should be tapered down to a square point. With this tool and a mallet, a hole should be made in the road large enough to receive the cube of metal, which should be stuck firmly down, until the upper surface of the iron is on a level with the surface of the road. The stone chip caused by making the hole, should then be packed round the iron, and beat down by the mallet. One of these iron cubes should be placed in the manner above described in every four square inches of surface, and the road, if the work be done in summer, should be frequently and copiously watered, until the iron cubes become perfectly fixed and firm in their places, which will be the case in three or four days, even with a limited traffic over the road.

It was in this way that the experiment was made on the Holyhead Road; the cubes of iron were put in in the month of March, 1835, and became consolidated in about three days: very few were thrown out of their places by the horses' feet or the wheels of carriages during the period; and after they became consolidated there was not one observed to move. They have been now on the road two years, and they appear to have suffered scarcely any wear. The road has remained in a very perfect state up to the present time; and during the whole of last winter, which was singularly unfavourable for roads, it has required scarcely any scraping, and no repairs whatever from the time it was first laid down. There is nothing in the appearance of the road to indicate that it is at all different from common stone roads, and it requires a close examination to detect the iron. The horses do not slip in the least, and the wheels of carriages pass over it apparently with great ease of draught.

In streets, iron may prove of great advantage, as it will certainly diminish to a great extent the nuisance of constantly picking up the surface and laying on new materials. The iron of which the cubes are cast, may be of the very worst and cheapest description, and will probably not cost the third part of common castings.

Chapter XIII, *on Carriages*, contains some judicious remarks, and points out the mode that should be adopted in their construction in order to produce the least injury to roads, and at the same time to promote the best interests of coach proprietors, and the convenience of the public.

As the expense of maintaining a road in good order depends in some degree upon the sort of carriages which are made use of, a few remarks on different kinds of carriages may be introduced with propriety into this work.

When a road has been made with very hard materials, and it has a very smooth surface, a wheel in rolling over it, even bearing a great weight, does very little injury; but when it has been made with weak materials, a wheel cuts and injures the surface in proportion to the weight it carries. The general ignorance of road-making on right principles, led all those who first undertook to improve the roads to attempt to make bad materials do as well as good ones, by regulating the breadth of the tires of wheels, and by limiting the weight to be carried on them. The consequence was, a great quantity of absurd legislation, and no improvement in the roads; and this, simply because it was impossible to make a good road with bad materials. If roads were made sufficiently strong and hard, of a proper form, and kept well drained and scraped, the only case in which the legislature need interfere, is to prevent the injury that wheels do which have nails projecting above the tires of them. With such roads, the interests of carriers of all kinds would lead them to make use of no other than one horse carts, as in Scotland and Ireland, and then the loads would never be so great as to produce any injury to a perfectly good road.

The experience of the use of one horse carts in Scotland and Ireland shows, that a much greater weight can be drawn by horses when working single than when they are joined together. The reason of this is, that it is impossible to make two or more horses exert their strength so that each horse shall regularly and steadily draw its proper share of a load. The common load of a one horse cart in Scotland and Ireland is 30 cwt., exclusive of the cart, while the average load that a horse draws in an English waggon is no more than 15 cwt., exclusive of the waggon.

The most simple and effectual way of getting rid of the injury which very heavily laden waggons do to roads would be, to increase the rate of toll on any additional horse; for instance, if the toll was 4d. on one horse, it should be 10d. on two, 17d. on three, and so on.

With respect to carriages used for carrying passengers, it would appear that the business of building carriages not having been interfered with by the legislature has been carried on very much to the advantage of the public. In other countries, France for instance, it is otherwise, for the shape and slow rate of moving of a French diligence is wholly owing to a most absurd regulation respecting the breadth of the tires of the wheels. But although stage coaches are so built in England as to allow of travelling with safety and convenience, and at a cheap rate, the comfort of travellers might be increased, and the labour of horses diminished, if the body of a coach were made larger, the fore wheels made higher, the springs made longer and slighter, and the weight made to rest chiefly on the hind wheels. * *

Although science, if properly applied, will certainly lead to improvement in the construction of coaches, a series of experiments should be made, in order to determine, with complete accuracy, what is the full effect of wheels, springs, and good roads in diminishing the labour of horses.

Mr. M'Neill's invention of an instrument for trying the draught of carriages, which has been found to be perfectly fit for the purpose, now admits of such experiments being made with a certainty of leading to accurate results; and it is very important that they should be made. In point of fact, although the extracts which have been taken from works of science are quite sufficient to convince all persons who have received a scientific education that the fore wheels of a coach ought to be high, and that the greater part of the load should be placed over the hind ones, as it happens that few of those persons who are concerned in the directing of the building and in the building of coaches have ever applied themselves to scientific inquiries, so as to know either why spokes are called levers, and what the property of the lever is, or what the effects are of the friction of wheels in turning on their axles and in moving on roads, it is quite necessary that experiments should be made, so that, by showing how much work horses actually do in drawing different kinds of carriages, nothing shall be left wanting to expose the prevailing errors with respect to wheels, and the proper manner of loading coaches.

As Mr. M'Neill's instrument can be fixed to a coach, with the horses to it, what it shows is, the actual force or labour which they exert in drawing; and, therefore, the experiments made with this instrument are not liable to errors, like other experiments, where it is necessary to use a substitute for the real power.

The expense of making a proper set of experiments would amount to some hundred pounds: as, however, there exists nothing to make it worth the while of any private person to incur it, those experiments should be ordered and paid for by government. This small expenditure would soon be repaid by the saving which would be effected by diminishing the labour of horses in drawing stage coaches, and, consequently, the expense, which now falls indirectly on the public in providing a sufficient number of them, and maintaining them.

The Churches of London. Nos. XVIII. XIX. and XX. By George Godwin, Jun. F.S.A., assisted by John Britton, Esq., F.S.A. London: C. Tilt; 1838.

This work proceeds with the same spirit as at its commencement; and deservedly increases in favour with the public. The present numbers are interspersed with numerous archæological notices of the Churches, Tombs, and Monuments found in the City.

Sketch of the Civil Engineering of North America; comprising remarks on the Harbours, River and Lake Navigation, Lighthouses, Steam Navigation, Water-works, Canals, Roads, Railways, Bridges, and other works in that Country. By DAVID STEVENSON, Civil Engineer. London: John Weale; 1838.

Of travellers in America, and of Journals published by them on their return; of praises of the Journalizers by their political and religious friends, and of blame and reproach heaped upon them by their political and religious foes; of conclusions drawn by all parties in turn, demonstratively proving the truth of their own views and the soundness of their own principles; we have had, are having, and probably shall long continue to have, a rapid and ceaseless succession. "What's the newest work?" asks the reader of travels, of the provincial circulating-library keeper; and he, looking somewhat dolefully to the accumulations on his shelves, replies

> "That of an hour's ago doth hiss the speaker;
> Each minute teems a new one."

Under such circumstances, we thank Heaven that we are not a literary journal; and can let this mighty current of literature sweep past us unnoticed, and without troubling our philosophical tranquility. Yet it suggests to us one reflection, in which we think all our readers will concur;—whatever they may think of the books themselves, they will agree that that *is*, and *must be*, an interesting country of which so much is written, and—it is to be supposed—so much read.

America *is* an interesting country;—few so universally interesting. It is emphatically the *new* world; and as such it is interesting to every inhabitant of the *old*. The mighty features of this vast continent, its never ending rivers, its wide extended inland lakes, its trackless forests, its lofty mountains, its prairies bounded only by the distant horizon,—all marked it out on its discovery as the land of wonders, and give it continued and increasing importance as its civilization extends, and its natural riches are further and further unfolded. As a new world, it presents a curious and most interesting study to the inhabitants of the old; as exhibiting under new and frequently most unexpected forms, those arts and manifestations of civilized life which it has transplanted from the elder continent. This study, every man will naturally pursue in his own way; the politician will look to American politics; the divine, to American manifestations of the universal religious principle; the naturalist, to American productions in earth and sea and air; the manufacturer and merchant, to American manufactures and commerce. And all will find much to interest them in their peculiar pursuits.

So do we look to American Engineering with lively interest. For British mechanical skill to be placed in circumstances of position so peculiar and so advantageous, without distinguishing itself by its spirit in overcoming difficulties, and its eagerness in availing itself of all favourable incidents, would be a moral impossibility. Nor have our Transatlantic brethren disappointed the expectations which we had a right to form of them. Their noble rivers have not been bestowed upon them in vain; but have furnished them with a grand and most complete system of inland navigation. So too, the vastness of their dominions has forced upon them a vast system of communication by land;—but the force has been gentle, for it has had to work upon what appears to be a kind of natural genius for locomotion And we may safely add, that in all branches of engineering, we have in America a wide field for study, both interesting and useful. A judicious and liberal comparison of British and American practice, cannot but be attended with mutual pleasure and advantage.

It is then with much satisfaction, that we perceive one of the latest American tourists and journal-writers, to have been an engineer, fitted by education and taste, to give us information on these interesting subjects. Nor will his book be read with the less attention, from its coming from the son of the well-known engineer of the Bell-rock Lighthouse.

Mr. Stevenson, taking advantage of a short interval of professional leisure, resolved to visit the Canadas and the most interesting parts of the United States; for the express purpose of examining for himself the much talked of, but little known, engineering works of America. During a tour of three months, he travelled over some thousands of miles, and collected together a vast variety of interesting facts relating to his subject of inquiry. The results, he has published in the present work; not however, as he states, to satisfy the curiosity of engineers in England; but rather to stimulate others who may have it in their power to examine more thoroughly the ground which he has gone over hastily, and to extend their researches further. We have read the "Sketches" with considerable interest; and have little doubt that they will prove equally acceptable to the profession generally.

Mr. Stevenson directs his attention in the first place to *Harbours*, describing the natural facilities which America affords for their formation on her coast;—facilities, he states, such as no works of art alone could supply. After taking a rapid glance at the Bay of New York, and explaining the mode of constructing the jetties, wharfs, and landing places at that port, he notices likewise the other principal harbours, both of the United States and of British America. Two following chapters are devoted to *Lake* and *River* Navigation; which brings us to the most interesting portion of the work, that which relates to *Steam Navigation.*

Whatever differences of opinion may exist as to the actual invention of the steam-boat, there is no doubt that steam navigation was first fully and successfully introduced into real use in the United States of America, and that Fulton, a native of North America, launched a steam-vessel at New York in the year 1807; while the first successful experiment in Europe was made on the Clyde in the year 1812, before which period steam had been, during four years, generally used as a propelling power in the vessels navigating the Hudson. * *

It would be improper to compare the present state of steam navigation in America with that of this country, for the nature of things has established a very important distinction between them. By far the greater number of the American steam-boats ply on the smooth surfaces of rivers, sheltered bays, or arms of the sea, exposed neither to waves nor to wind; whereas most of the steam boats in this country go out to sea, where they encounter as bad weather and as heavy waves as ordinary sailing vessels. The consequence is, that in America a much more slender build, and a more delicate mould, give the requisite strength to their vessels; and thus a much greater speed, which essentially depends upon these two qualities, is generally obtained. In America, the position of the machinery and of the cabins, which are raised above the deck of the vessels, admits of powerful engines, with an enormous length of stroke, being employed to propel them; but this arrangement would be wholly inapplicable to the vessels navigating our coasts, at least to the extent to which it has been carried in America.

We are constantly hearing of such great exploits on the part of the Americans, respecting the performances of their steam-engines, as to excite not only frequent surprise, but also occasional doubt. The reports of Mr. Stevenson are important in this respect, and may tend in some measure to throw light on the construction of American steam-boats and engines.

These steam boats may be ranged under the following classification. first, those navigating the Eastern Waters. This class includes all the vessels plying on the river Hudson, Long Island Sound, Chesapeake and Delaware Bays, and all those which run to and from Boston, New York, Philadelphia, Baltimore, Charleston, Norfolk and the other ports on the Eastern coast of the country, or what the Americans call the Sea board. Second, those navigating the Western Waters, including all the steamers employed on the river Mississippi and its numerous tributaries, including the Missouri and Ohio. Third, the steamers engaged in the Lake navigation. These classes of vessels vary very much in their construction, which has been modified to suit the respective services for which they are intended.

The general characteristics by which the Eastern Water boats are distinguished, are, a small draught of water, great speed, and the use of condensing engines of large dimensions, having a great length of stroke. On the Western Waters, on the other hand, the vessels have a greater draught of water and less speed, and are propelled by high pressure engines of small size, worked by steam of great elasticity. The steamers on the Lakes, again, have a very strong build and a large draught of water, possessing in a greater degree the character of *sea* boats than any of those belonging to the other two classes. They also differ in having masts and sails, with which the others are not provided.

The steam boats employed on the Hudson River are the first, belonging to the class of vessels navigating the Eastern Waters, of which I shall make more particular mention.

* * In order to explain more clearly the general arrangement of their parts and mode of operation, I shall give in detail the dimensions of the steam boat Rochester, plying between New York and Albany. * *

The Rochester measures 209 feet ten inches in length on her deck. This measurement applies also to the length of her keel, her stern post and cut water being perpendicular. The maximum breadth of beam is 24 feet. The projection of that part of the deck called the wheel guards, beyond the hull of the vessel, is 13 feet on each side. The maximum breadth of the vessel measured to the outside of the paddle wheels, is 47 feet. The depth of hold is 8 feet 6 inches. The draught of water, with an average number of passengers, is four feet. The diameter of the paddle wheels is 24 feet. The length of the float boards, which are twenty-four in number, is 10 feet. The dip of the float-boards is 2 feet 6 inches. This vessel is propelled by one engine, having a cylinder of 43 inches in diameter, and the length of stroke 10 feet. The engine condenses the steam, which works expansively, and is cut off at half-stroke.

The great competition that exists in the navigation of the Hudson produces constant *racing* between boats belonging to different companies; and this is not unfrequently attended with serious accidents. When the Rochester is pitched against another vessel, and at her full speed, the steam is often carried as high as forty-five pounds on the square inch of the boiler; and the piston makes twenty seven double strokes, or in other words, moves through a space of 540 feet per minute, or 6,13 miles per hour. In this case

the circumference of the paddle-wheels moves at the rate of 25.13 miles per hour. In ordinary circumstances, however, the engine is worked by steam of from twenty-five to thirty pounds pressure on the square inch; and in this case the piston makes about twenty-five double strokes per minute, moving through a space of 500 feet per minute, or 5.68 miles per hour; and the circumference of the paddle-wheels moves at the rate of 21.42 miles per hour. The rate at which the pistons of marine engines in this country move, seldom exceeds 210 feet per minute. The pistons of locomotive engines, generally move at the rate of about 300 feet per minute; but both of their speeds are very short of the velocity of the Rochester's piston. * *

I found no variety in the construction of the paddle-wheels of the different American steam-boats. * *

The float-boards do not extend across the whole breadth of the paddle-wheels, as is always the case in this country. They are divided into two and sometimes three compartments, and the wheel is furnished with three and sometimes four sets of spokes arranged in parallel planes. "This construction was introduced by Mr. Stevens of New York, and may be described," says Dr. Renwick, "by supposing a common paddle wheel to be sawn into three parts in planes perpendicular to its axis. Each of the two additional wheels that are thus formed, is then moved back, until their paddles divide the interval of the paddles on the original wheel into three equal parts.

"In this form the shock of each paddle is diminished to one-third of what it is in the usual shape of the wheel; they are separated by less intervals of time, and hence approach more nearly to a constant resistance; while each paddle following the wake of those belonging to its own system, strikes upon water that has been but little disturbed." * *

The American steamers are generally propelled only by one engine, and a counter-balance attached to the paddle-wheels is in some cases found necessary, to enable the engine to turn its centres. The great length of the stroke however, allows time for a degree of momentum to be generated, which is sufficient in most cases to carry the engine past its centres; and failing this, the paddle-wheels, from their large diameter, become good generators of momentum, and act in the same way as the fly-wheels of land engines in regulating their motion. Even in those vessels where two engines are employed, their connecting-rods are not attached to the same axle; each engine works quite independently of the other, and drives only one of the paddle-wheels; whereas in this country, the connecting rods of both engines are attached to the same axle, by cranks placed at right angles to each other, so that one engine is exerting its full power at the very moment when the other is expending none of its force, and the power is thus employed in the most advantageous manner for keeping up the speed. The short stroke and comparatively small diameter of the paddle-wheel in European boats, renders this construction necessary to enable engines to pass their centres.

The general construction of the boilers, and the arrangement of the flues, in the steam boats on the Eastern Waters, resemble in a great measure those of European steamers. The flame and smoke generated in the fire place by the combustion of the fuel, pass through flues in the interior of the boiler, and are afterwards discharged into the smoke-tube. The boilers are strengthened in the usual manner, by means of iron braces or ties, arranged so as to form a strong connexion between the interior surfaces, and thus render them more capable of resisting the expansive force of the steam, which has a tendency to tear them asunder.

The vessels which ply on the Western waters, are not equal either in workmanship or speed, to the Eastern water boats. They vary from 100 to 700 tons burden, and are generally of a heavy build, flat in the bottom, and draw from 6 to 8 feet of water.

The hull is covered with a deck at the level of about five feet above the water, and below this deck is the hold, in which the heavy part of the cargo is carried. The whole of the machinery rests upon the first deck; the engine being placed near the middle of the vessel, and the boilers under the two smoke chimneys. The fire doors open towards the bow, and the bright glare of light thrown out by the wood fires, along with the puffing of the steam from the escapement pipe, produce a most singular effect at night, and serve the useful purpose of announcing the approach of the vessel when it is still at a great distance. The chief object in placing the boilers in the manner described, is to produce a strong draught in the fire place.

Who can wonder at hearing of the constantly occurring accidents to American steam-vessels, when he has read the following extract?—

The engines are generally very small in proportion to the size of the vessel which they propel; and, to make up for their deficiency in volume, they are worked by steam of great elasticity. The Rufus Putnam, for example, a pretty large vessel, drawing six feet of water, which plies between Pittsburg on the Ohio and St. Louis on the Mississippi, is propelled by a single engine having a cylinder 16 inches diameter, and 5 feet 6 inches in length of stroke; but this engine is worked by steam of a most dangerously great elasticity. The captain of the vessel informed me that, under ordinary circumstances, the safety-valves were loaded with a pressure equal to 138lb. on the square inch of surface; but that the steam was occasionally raised as high as 150lb., to enable the vessel to pass parts of the river, in which there is a strong current; and he added, by way of consolation, that this amount of pressure was never exceeded except on extraordinary occasions! I made a short voyage on the Ohio in this vessel, but after receiving this information, I resolved to leave her on the first opportunity that presented itself.

The *Fuel* generally employed for steam-engines in America, is wood, which varies in price from 5s. to 20s. per "*cord*" containing 128 cubic feet. Pine timber is considered the best; and about 2½ cords of wood are stated to be equal to one ton of coal, in power of generating steam in well constructed boilers. Anthracite coal is sometimes used, both for steam boats and locomotive engines; but not to any great extent.

The *Canals* of the United States, appear to be of very great extent; and our author gives a very interesting account of them in chapter VI.:—

The zeal with which the Americans undertake, and the rapidity with which they carry on every enterprize, which has the enlargement of their trade for its object, cannot fail to strike as a characteristic of the nation, all who visit the United States. Forty years ago, that country was almost without a lighthouse, and now no fewer than two hundred are nightly exhibited on its coast; thirty years ago, it had but one steamer and one short canal, and now its rivers and lakes are navigated by between five and six hundred steamers, and its canals are upwards of two thousand seven hundred miles in length; ten years ago, there were but three miles of railway in the country, and now there are no less than sixteen hundred miles in operation. These facts appear much more wonderful when it is considered, that many of these great lines of communication are carried for miles in a trough, as it were, cut through thick and almost impenetrable forests, where it is no uncommon occurrence to travel for a whole day without encountering a village, or even a house, excepting perhaps a few log huts inhabited by persons connected with the works. * *

The great length of many of the American canals is one remarkable feature in these astonishing works. In this respect they far surpass any thing of the kind hitherto constructed in Europe. The longest canal in Europe is the Languedoc, which has a course of 148 miles; and the most extensive in the United States is the Erie Canal, which is no less than 363 miles in length.

The *Roads* and *Bridges* of America next engage Mr. Stevenson's attention, in the two succeeding chapters. The timber bridges appear to have no particular limit to the immense span of their arches. The largest spans are formed of wooden arcs, with suspending rods to carry the road-way. The bridge over the Susquehanna at Columbia, is considered the most extensive arched bridge in the world; it was begun in 1832 and finished in 1834.

It is certainly a magnificent work, and its architectural effect is particularly striking. It consists of no less than twenty nine arches, of 200 feet span; supported on two abutments, and twenty eight piers of masonry, which are founded on rock, at an average depth of six feet below the surface of the water. The water way of the bridge is 5,800 feet: and its whole length, including piers and abutments, is about one mile and a quarter. The bridge is supported by three wooden arcs, forming a double roadway, which is adapted for the passage both of road and railway carriages. There are also two footpaths, which make the whole breadth of the bridge thirty feet. The arcs are formed in two pieces, each measuring seven inches broad by fourteen inches in depth. These are placed nine inches asunder; and the beams composing the wooden framing, by which the roadway is suspended, are placed between them, and fixed by iron bolts passing through the whole.

There is another bridge over the Schuylkill at Philadelphia, consisting of a single arch of no less than 320 feet span, having a versed sine of about 38 feet. This bridge has a breadth of roadway of about 30 feet. It has been erected for several years, and is still in good repair and constant use.

Another description of bridge which is much used on the American railways, and sometimes for so large a span as 150 feet, is that called "Town's Patent Lattice Bridge." From the drawings given of it, it appears to us to be similar to that of Smart, for which a patent was taken out some years since in this country. We are not, however, aware of any bridge of large span having been erected in England on Mr. Smart's principle. But we are happy to hear from Mr. Stevenson, of its successful adoption in America; and we trust that the English patentee will be able to avail himself advantageously of the information given in the work before us.

Mr. Stevenson next describes the American method of constructing *Railways*, illustrated by several drawings; but this we may pass over, as being very similar to the information given on the subject in the first number of our Journal. The American *Locomotive Engines* are similar in construction to the English six-wheeled engines, and their cost is about the same.

They are arranged in the following manner, so as to allow the engine to travel on rails having a great curvature. The driving wheels, which are five feet in diameter, are placed in the posterior part of the engine, close to the fire-box; and the fore part of the engine rests on a truck, running on four wheels of about two feet six inches in diameter: a series of friction-rollers, arranged in a circular form, is placed on the top of the truck, and in the centre stands a vertical pivot which works in a socket in the framing of the engine. The whole weight of the cylinders and the fore part of the boiler rests on the friction rollers, and the truck turning on the pivot as a centre, has freedom to describe a small arc of a circle; so that when the engine is not running upon

a perfectly straight road, its wheels adapt themselves to the curvature of the rails, while the relative positions which the body of the engine, the connecting-rods, and other parts of the machinery bear to each other, remain unaltered.

An apparatus called a *Guard* is described and illustrated by drawings; it is attached to the outside of the fore axle of the engine, for the purpose of removing any obstruction that may be upon the rails. It consists of a strong framework of wood, filled in with bars of iron and wood parallel to the sides, like a grating or gridiron. It slopes down from the axle, to within an inch of the rails; and is kept at that height above them by two wheels, two feet in diameter, which run on the rails about three feet in advance of the engine. The outer extremity or point of the framework, is shod with iron and slightly bent up.

A drawing is given, of a locomotive engine used on the Washington and Baltimore Railway, constructed for the combustion of anthracite coal. It is very different in appearance from ordinary engines, having a vertical cylinder, with a vertical tubular boiler. It weighs about eight tons.

The *Gradients* of the inclined planes on some of the railways, appear tolerably stiff. On the Philadelphia and Columbia line, for instance, we meet with gradients of one in 14·6, and one in 21·2. And on the same railway there are numerous curves, many of them very sharp, the minimum radius being so small as 350 feet.

The *Passenger carriages* are described as being—

—extremely large and commodious. They are seated for sixty passengers, and are made so high in the roof, that the tallest person may stand upright in them without inconvenience. There is a passage between the seats, extending from end to end, with a door at both extremities: and the coupling of the carriages is so arranged, that the passengers may walk from end to end of a whole train without obstruction. In winter they are heated by stoves. The body of each of these carriages measures from fifty to sixty feet in length, and is supported on two four-wheeled trucks, furnished with friction-rollers, and moving on a vertical pivot, in the manner formerly alluded to in describing the construction of the locomotive engines. The flooring of the carriages is laid on longitudinal beams of wood, strengthened with suspension-rods of iron.

We rather expect that in winter, the passengers in some of the large railway carriages at home, will feel the want of the American luxury of a stove inside.

Under the head of *Water-works*, in chapter X., we learn that the supply to many of the large cities, is obtained by water power. The most extensive works of this kind are the Fairmount water-works at Philadelphia; on which it appears that the sum of 276,206*l.* had been expended up to the year 1836. A dam, 1,600 feet long, has been erected across the river Schuylkill; and the water is raised to an elevation of 92 feet by means of six double acting force-pumps, having a stroke of six feet, and each raising daily on an average 530,000 gallons. The pumps are worked by six water-wheels, varying from 15 to 16 feet in diameter, 15 feet in breadth, and making 13 revolutions per minute. The water is conveyed from the reservoirs and distributed through the town, by means of 98¾ miles of cast-iron pipes from 3 to 12 inches diameter, and two mains of 22 inches diameter.

The supply of water at New York, is from wells sunk in different parts of the city, and raised by steam power to elevated reservoirs, whence it is distributed by pipes.

One well, belonging to the corporation, is 113 feet in depth. For the purpose of collecting water, there are three horizontal passages leading from the bottom of the well, which measure four feet in width, and six feet in height; two of them are seventy-five, and the third is one hundred feet in length. * * This mode of collecting water in subterraneous galleries has been successfully practised in this country, on a great scale, at the water-works of Liverpool, by Mr. Grahame, the engineer to the Harrington Water Company.

The chapter on *Lighthouses* describes their construction and lighting apparatus; and gives various particulars relative to their annual cost, their number, management, and other circumstances.

The concluding chapter is on *House-moving*;—rather a curious trade, and very little known in England, though we believe it was practised in the neighbourhood of London, some years since. Mr. Stevenson very minutely describes the process as adopted in America, and gives sketches of the buildings removed, and the apparatus employed.

I saw the operation put in practice on a brick house, at No. 130 Chatham-street, New York, and was so much interested in the success of this hazardous process, that I delayed my departure from New York for three days, in order to see it completed. The house measured fifty feet in depth by twenty-five feet in breadth of front, and consisted of four storeys, two above the ground-floor, and a garret-storey at the top, the whole being surmounted by large chimney-stacks. This house, in order to make room for a new line of street, was moved back, fourteen feet six inches from the line which the front wall of the house originally occupied. * *

I understood from Mr Brown (the contractor) that the whole operation of removing this house, from the time of its commencement till its completion, would occupy about five weeks; but the time employed in actually moving the house fourteen feet and a half, was seven hours. The sum for which he had contracted to complete the operation was 1,000 dollars, which is equal to about 200*l.* sterling. Mr. Brown mentioned that he and his father, who was the first person who attempted to perform the operation, had followed the business of "house-movers" for fourteen years, and had removed upwards of a hundred houses, without any accident; many of which, as in the case of the one I saw, were made entirely of brick.

Notwithstanding our copious extracts from this interesting work, there are several parts that we have not been able to allude to; in conclusion we beg to refer the reader to the volume itself, which we are sure will amply repay an attentive perusal.

British and Foreign Review, No. XIII: *Christian and Pagan Architecture.*

Wherefore this article should be so headed in the publication itself, while in the advertisements it is entitled "The Spirit of Architecture," the editor can best explain. Probably the last-mentioned title was an after-thought, and adopted as being more likely to catch attention than the other; and, in fact, it led us to anticipate something quite fresh on the subject, whereas the article turns out to be little more than a dissertation on the very hackneyed subject of the Grecian and Gothic styles, tacked to "Hope's Historical Essay on Architecture," which is made to serve as the text of it. Still, a clearer exposition of the subject than has hitherto been given, would have been acceptable; instead of which we find it mystified to such a degree as to be rendered nearly incomprehensible—at least to those who are not accustomed to the more subtle and refined speculations of criticism, or to such fanciful language as the following:—

In the fifteenth century, it (namely pointed architecture) came to its end. The powerful but genial winter, the time of inner life, of concentrated unity, was accomplished; and that unity by the love of its being, was now to branch forth, to bud out, to blossom into multiplicity again. And how could the age of Raphael and Michael Angelo, and of Luther, the age of Shakspeare and Cervantes, any longer endure the devout monotony of the pointed style. With the expansion and cultivation of the nature of men, using the word nature as opposed to the supernatural, there returned of course the ancient doctrines; the semicircle and rectangle, the happy medium between excess and deficiency, the full development and even balance of perfect form, once again were loved and understood.

It may be intended to enlighten, but this kind of writing, we suspect, is far more likely to bewilder the reader than to inform him, by conveying any clear ideas on the matter. Even when something of a meaning is got out of it, to what does it amount?—what information does it convey? Hardly any thing that can fairly be called practical. Of speculation and theorizing on the origin and original character of different styles, we have had enough—almost *ad nauseam*—without being as yet hardly a single step nearer any sound and sufficient system of design adapted to our actual purposes and habits, than we were at the very outset of such inquiry. Each writer has in turn gone over the same ground, has examined it, according to his own fashion, up to the very same point, and has there abandoned it, without making the least effort to carry on his inquiry further, and deduce from it some clear and definite principles. No one that we are aware of, has yet attempted to show by various instances drawn from actual buildings of recent times, how far the styles adopted for them have been followed consistently and successfully; how far and in what respect their proper character has been mistaken; or whether in any such buildings, ideas are to be detected for carrying on and working out the style adopted, so as to render it more pliable and manageable for purposes different from those which first called it forth. Whether particularly useful or not, such an inquiry would at least possess some novelty of interest, and might elicit what has hitherto been overlooked.

In the article before us, one of the cleverest and most perspicuous remarks is this:—

The utility of a thing is its utility, and its beauty is its beauty; nor can we by any juggling equation get rid of either term, or make one stand for the other.

In this pithy sentence the writer completely nullifies the doctrine that beauty has its origin in, and is identified with utility; a doctrine to which we ourselves are opposed, though we do not deny that the satisfaction derived from any work of architecture is greatly increased when we perceive that both beauty and utility are made mutually to enhance each other;—that what is done for convenience increases beauty, and that what is done for the sake of beauty increases convenience also.

But when we read what follows almost immediately afterwards, we very much doubt whether such transcendently philosophical

matter will not be considered by most readers as little better than refined jargon :—

All beauty, then, is an outward expression of inward good; and either of that which is good for all soul as soul in itself, and exercising its two prime faculties of expansion and concentration, of grandeur and harmony, or else for what is good for the individual being in particular forms of life. Consequently the highest beauty of individual things is exhibited, when the thing is such as to be susceptible of the most intimate combination with the most universal forms. According to such views we would lay down this definition, that the art of so treating objects as to give them a moral significance, is *the fine art*. As in arithmetic the fractional numbers must be reduced to relative unity with some one whole before they can be managed; so, we affirm, must the partial existences of the visible world be reduced to a kind of common denomination with those of the inner world, before they can be available as expressions, to use another mathematical term, of beauty; and be the thing *a*, *b*, or *c*, we believe that by skilful treatment of its form, it may be brought to have such a meaning.

To which we say, that had the writer illustrated the drift of all this by some well-selected cases that would have served to illustrate and explain it, we might then have been able to work out the meaning of it. At present it reads to us not like nonsense, but as something quite beyond the sphere of common sense and the reach of ordinary faculties. Whatever, therefore, they may be intended to do, papers of this description are not calculated to instruct either the general reader or the professional man on the subject, but rather to involve it in a labyrinth of strange-fangled phraseology.

LITERARY NOTICES.

The great length of our remarks on the Commissioners' Report on Railways in Ireland, compels us to postpone the consideration of several works which we intended to notice.

A Dictionary of the Architecture and Archæology of the Middle Ages, &c., with etymology, definitions, &c.; also biographical notices of ancient Architects: by J. Britton, F.S.A.—We have not been able to devote to this work that attention which its importance demands; and consequently we must defer our remarks upon it till the next number.

Geology as a Science applied to the reclamation of Land from the Sea, the construction of Harbours, the formation of Railroads, and the discovery of Coal; by John Rooke.—A work comprehending such important applications of geology, requires a careful and considerate perusal, before we can presume to give an opinion upon its contents; it will be noticed in the ensuing Journal.

The Arcanum; comprising a concise theory of practical, elementary, and definite Geometry, exhibiting the various transmutations of Superfices and Solids; by John Bennet, Engineer: Nos. 3 and 4.—The title so fully expresses the object of the work, that it does not require of us to say many words respecting its contents; it contains many geometrical figures ingeniously divided and subdivided in a variety of ways.

Mr. Lawrence's new work on Perspective, requires consideration; it shall not be delayed longer than next month.

Mr. Hughes's work on the Practice of making and repairing Roads, contains much useful information for the engineering student; it is also published at a low price, which is another recommendation. We shall not omit to notice it next month.

A Practical Treatise on the construction of Stoves and other Horticultural Buildings, by J. W. Thompson;—contains, so far as we can judge by a cursory glance, a great deal of information illustrated by numerous wood-cuts, and in a very unassuming and cheap form. We recognise with pleasure Mr. Thompson's "economic egg-shaped boiler," of which he furnished us with a description and drawings in our 2nd number, p. 25.

ORIGINAL PAPERS, COMMUNICATIONS, &c.

RALPH REDIVIVUS.—No. 9.

THE ROYAL INSTITUTION.

In selecting the building in Albemarle-street for the subject of my present article, I purpose to make use of it chiefly as a text for certain general remarks; there being in fact little in the design itself that does not discover itself at the first glance, without awaiting further investigation. And as it seems that Omega continues to read my articles, notwithstanding he holds them to be utterly worthless, I may be allowed to address a few more words to him, explanatory of the course I have pursued and to which I intend to adhere. In undertaking this series, one primary object with me was, to infuse a little life and spirit into architectural criticism, which has hitherto been for the most part dry in tone, scanty in observation, and superficial in remark. For saying this, Omega will consider me a very impudent fellow. Very possibly he may there be quite right; nor can he on that score tax me with inconsistency, for I have never in the course of these lucubrations affected modesty, or spoken with a "by your leave" timidity, as if fearful that I was getting quite out of my depth. The very circumstance of a man's assuming to himself the office of critic, is tantamount to a declaration that whether qualified or not, he at least considers himself qualified to direct the opinion of others; or if he doubts it, his modesty is in inverse ratio to his own misgivings.

It is not for me to assert that every opinion I have expressed is incontrovertible; it is enough for me to be able to declare that I have spoken in sincerity, and that so far from passing peremptory judgment in a few general terms, in the *sic volo sic jubeo* style, condemnatory or laudatory as may be, I have invariably endeavoured to explain my reasons, even at the hazard of occasionally appearing to be prolix, and to advert most circumstantially to every particular. So far I may arrogate to myself the merit of having done something towards improving architectural criticism, by endeavouring to rescue it from the dryness and inanity which have pervaded almost all that has hitherto passed for such. Nor will my attempt be much the less serviceable, even should some of the opinions I have promulgated be found on examination to be erroneous; since owing to their being so fully stated, their correctness or incorrectness manifests itself the more clearly. Consequently those who dissent from me, will at least know what it is against which their counter opinions ought to be directed; and thus be able to dispute the debateable ground with me inch by inch. My saying all this will, no doubt, be considered very egotistical: the excuse must be, that I have been in a manner compelled to vindicate myself from a sweeping charge of incompetency for the task I have undertaken in these papers. With which observation I here dismiss a matter to which I do not intend to recur again, unless the necessity for doing so should be forced upon me.

This preliminary over, I now commence my strictures on the new façade in Albemarle-street, by observing that it is precisely the sort of thing calculated to pass with the million for grand and classical; though it can hardly help offending the judicious, and disappointing those who are unreasonable enough for something betokening originality and gusto. It just suffices to convey to us the notion of the effect that would be produced by a continued range of Corinthian columns, executed upon such a scale that the order itself may be called majestic. Yet what great merit is there in that, if everything besides tends to contradict, to interfere with, and to vitiate, the effect apparently proposed? Undoubtedly the first glance promises well enough; but then it is only to disappoint us the more when upon coming up to the building, we discover what it actually is, and begin to scan it more closely.

We then perceive that we have been deluded at a distance by a mere architectural *mirage*; and that the fancied colonnade in front of an edifice of corresponding character, turns out to be a row of semi-columns, placed against the piers of a house whose windows fill up the spaces between them. There being three tiers of windows within the height of the columns, is a favourable circumstance inasmuch as it gives a suitable intercolumniation to the order itself: in every other respect, however, the great number of windows decidedly produces a character totally at variance with that which should attend the order. Had there been either the columns without the house behind them, or the house without the columns, we should have less reason to be dissatisfied. At present, the eye is offended by the palpable incongruity of decoration, so exaggerated as to make the thing intended to be adorned appear quite contemptible—absolutely put out of countenance by the finery heaped upon it.

The whole is disproportioned; because there is no proportion observed between the *polyfenestral* building itself, and the range of columns stuck up against it—not the slightest similarity of taste, for that which manifests itself in the windows is altogether of a different kind from that expressed by the order; the latter being vigorous and florid, the former poor, jejune, and wofully insipid.

On such occasions the problem is, not to produce a correct copy of so many columns, in stone or compo,—for that, as the readers of this journal must be well aware, is a matter altogether mechanical,—but to introduce them so that they shall appear *motived* by the idea, and everything else in the design perfectly accord with such features, and be in unison with the fundamental æsthetic note—in other words, with the order. What the architect therefore has to consider, is how he can work up the subordinate features to the same pitch as the principal ones—not, indeed, so as to interfere with them, but so that while subordinate they shall exhibit the same degree of finish, the same study, the same style of decorative detail. Unless this be done, unity of character is forfeited; and though there may be something to admire in parts, the whole will be as incongruous as a painting that should be carefully finished up in some places, and hurriedly slobbered over in others.

Did it happen that architects designed the details of the orders they

employ, instead of copying, there would then be greater excuse than at present for putting forth all their strength in them; because then, the merit attached to them would be their own. An order would then give evidence of the architect's invention; whereas, such being not the case, the least he can do is to take care that by the propriety of its application and the felicity of its effect in his composition, it shall testify both his correctness of taste, and his skill in combination. So very far, however, is this from being generally the case, that one might be pardoned for imagining that columns are oftener than not made to stand in lieu of all further attempt at design, and are the refuge of indolence and incapacity. Take away them, and we shall as often as not, find nothing worthy the name of architecture left; at the same time take away them, and as frequently as not, it will be impossible to discover that they ought to be supplied.

But what has this to do with the building here spoken of? So much, at least, that the last remark applies directly to it; for supposing the order were to be taken away again, no one would miss it, or even if he did, he certainly would not guess from the windows, of what kind it had been; since so far from partaking in any degree of the character of the decoration shown in the columns and their entablature, the scanty mouldings bestowed upon them just serve to express their poverty and feebleness, and nothing more. But even this very meagre degree of finishing, is not extended to all the apertures, the third range of windows having no kind of dressings whatever; therefore as they come in between the capitals of the columns, the contrast between them and those masses of sculptured foliage is positively offensive—harsh, nay almost barbarous. Even had there been no columns at all, consistency would have demanded that if architectural finish were bestowed on any of the windows, it should be extended to all, although not in the same degree; for otherwise we have a mixture of two incompatible modes in the same design. Most probably the architect was apprehensive that if he bestowed any dressings on the uppermost windows, they and the capitals together would have produced a crowded-up and confused appearance. But then if he found that such would be the case, and that his first idea was so unmanageable, it behoved him to discard it, and adopt some other system of decoration for his façade.

Travellers have told us of savages who though otherwise in a state of complete nudity, wear military coats and cocked hats which they have obtained from Europeans in barter for other articles. Undoubtedly a savage so decked out fancies himself to be very splendidly attired, and perfectly *comme il faut* in his costume, notwithstanding that to European eyes he cuts a most grotesque and ludicrous figure. Yet we ourselves act pretty much like the savage, when we attempt to convert a plain building into a classical piece of architecture by the addition of columns and other things that so far from serving to hide its nudity, only render it all the more conspicuous. It is high time for us to have done with this barbarous pseudo-classical taste, which parodies the architectural costume of Greece and Rome quite as extravagantly as our good friend the savage does that of a military dandy.

The architect of the new front to the Royal Institution, will probably say that Rome itself—that is modern Rome—affords a precedent for what he has done; the temple of Marcus Aurelius having been converted into a building for the Dogana, by filling up its intercolumns with three tiers of windows. It is to be regretted then, that he did not adhere more closely to that example, which certainly affords no authority for the style of windows he has adopted, those of the Roman building having a boldness and greatness of manner, the very reverse of that shown in the Albemarle-street one. In the former, the deep friezes and cornices of the windows produce a certain effect arising from fulness, that is in keeping with the expression of the columns.

Another very striking defect in the front of the Royal Institution is, that instead of marking the centre as distinctly as possible, the architect has taken some pains to avoid all indication of entrance, by making the three doors resemble windows, and has thereby greatly increased the general monotony. This flagrant solecism in composition, is accompanied by another; namely that there is no marked termination to the façade, so that it looks after all, no better than a fragment, or as if it was intended to carry it on, along that whole side of the street; whereas pilasters coupled with the extreme columns, or pilasters only, would have served to define the extent of the composition. Had this front risen higher than those of the adjoining houses, so as to distinguish itself by its outline, then, indeed there would have been less occasion for doing so; yet even then, the want of some definite termination would have had a bad effect,—at present it amounts to a most inexcusable fault.

THE PARKS AND METROPOLITAN IMPROVEMENTS.

"Ne sutor ultra crepidam" (Plin.); which apophthegm being done into English and paraphrased, may be taken to mean that "the Duke of Wellington and the Lord Nelson should fight their battles; that the War Office and the Admiralty should amply provide the munitions of war; and that the Architects and Artists should determine and execute the memorials, which are to record and perpetuate their victories." We take this to be plain good sense. We never ventured to offer our advice to either of the abovenamed great commanders, during the campaigns of the one, or the cruises of the other; but if we had, we feel fully confident that (had we been answered at all) the reply would have been, "Ne sutor ultra crepidam."

This interference in things out of the range of our usual studies leads to strange anomalies. We have a committee, who in all probability now for the first time had the subject forced upon them, placing an equestrian statue contrary to all established rules of propriety, and avoiding an inconvenience by substituting an absurdity. We have men of the highest rank and intelligence in the country, striving to one great point; but intrusting to a small interested party—interested as working for a favourite—a work, in the arrangements for which they have shown themselves equally regardless of its merit as an example of high art, and of its position as a public monument. As a climax, we have a retail dealer from the East of Temple Bar (by the same heaven-inspired talent we presume) giving a public lecture to the Earl of Liverpool on the conduct he ought to pursue under the existing circumstances; and urging from his little desk at the back of his counter, his sense of propriety, on the noble and highly-gifted peer. To all this we say again and again, "Ne sutor ultra crepidam."

Having thus, *in our opinion at least*, established our right to be heard, *we* proceed to offer a few remarks on the proposed Wellington memorial; only adding that they were written and circulated in manuscript before the effigy *which has verified all our observations*, was placed upon the arch.

The object proposed to be attained by placing the statue of his Grace the Duke of Wellington on the arch in Piccadilly, is to give *it a position from whence it will be well seen.* Let us therefore examine the several points of view at which it will present itself to the spectator; and we shall immediately perceive that IT, *in no one instance*, comes in happily with the surrounding locality.

Assuredly not from the upper part of Hyde Park; for the ground rises so rapidly towards the North, that the enormous mass will from thence, be seen upon so low a pedestal—the arch itself being entirely lost—that it will appear to have sunk it into the earth.

On a nearer approach, it will appear to stand on the light and elegant colonnade; and when we have passed that barrier into Piccadilly, it will be seen at an angle and an elevation most detrimental to its effect. The height must also be very materially increased by another and more narrow attic, or one half of the horse will be masked by the projection of the cornice of the order.

It will NOT be seen on the spectator's approach to it from St. James's Street along Piccadilly, *until he has passed Park Lane.*

On the approach from Wilton Place and Knightsbridge, it will be seen rising over the Hospital, to which it may appear to be an accessary, until on nearing it, the hospital masks it entirely.

From the Park Road Westward (from Kensington), *it will not be seen at all.*

From these considerations it will be evident; that although on the first suggestion, the position may appear to be a commanding one, it is in effect, owing to the surrounding buildings and the line of streets and roads, less desirable than could possibly be imagined.

We are happy however in being able to indicate a point, but *very little removed* from that position, which combines every advantage, and of which we have made a plan, the lines of the streets being carefully copied from the parish plan in the Vestry Clerk's Office of St. George's, Hanover Square.

That point is IN THE GREEN PARK, OPPOSITE HAMILTON PLACE. It forms a point of intersection of the visual ray, FIRST from the top of St. James's Street; SECONDLY from Wilton Place, Knightsbridge; THIRDLY from Hamilton Place and the Park beyond; by a curious coincidence, from the Great Western Road of Hyde Park; and it is equally well seen from St. James's Park and Buckingham Palace. We most respectfully recommend this site to the committee.

But is there not something of precipitation, in thus adopting an equestrian statue for the Court end of the town, because the City has determined to have one in the East? The former can by possibility only excel the latter in size; and as by the same possibility it can scarcely be better than Sir Francis Chantrey's,—*and may be worse,*—the faults will be more evident in its increased volume. Bombast and

the colossal are however very nearly allied; they are alike the craving of a distempered appetite, and the bane of taste.

And *if adopted*, we do not see how the several enrichments and ciphers of Royalty can be made to accord with the intended statue. Are they to be removed, and others substituted? And where are the inscriptions to be placed that shall legibly inform the world, that the statue on the summit is the effigy of the Duke of Wellington, and not of George the 4th, to whom all the accessories have allusion?

In what position is the statue to be placed? Is the head to point North or South? There are objections to both positions; but if placed on the longer line of the pedestal, it will be placed contrary to all precedent and propriety.

With these numerous and very substantial objections both to the subject and the situation, how much more appropriate to the cause, would be the adoption of the military column of the Romans! Imagine for a moment the Column of Trajan on the spot we have designated. Forming a vista to the most frequented approaches of the town, it would at the same time rear its summit high over all the metropolis, and be visible for a large circuit of surrounding country. Its sculptured face would hand down to distant ages,—as the Trajan and Antonine columns do at this day—the banners and costumes of the several regiments engaged in perilous warfare under their great commander, whose statue crowning the whole, would complete the spiral line of glory.

August 6th, 1838.

We hope that the discussions that have taken place, will make the Wellington Memorial a subject of competition both for *site* and *subject*. We herein offer our opinion on both points,—and send in our design. When a discovery is made of a hitherto unknown country, it is customary to place the nation's flag upon the spot, and the usages of civilized life have given the sanction of law to the act. Under this acknowledged feeling, we claim the site we have described, and fix our banner upon it. It may be said that any one could see that the site would be a good one. In answer to this objection however, we only refer to the well-known story of Columbus and the egg; which is told also of Bruneleschi the architect of the church of St. Maria del Fiore at Florence. As these two great men were contemporaries, the fact probably occurred at that time, and has been attributed sometimes to the one, sometimes to the other. Our "esprit de corps" would give it to Bruneleschi.

J. H.

ON THE CONSTRUCTION OF SKEW ARCHES.

(*Continued from page 280.*)

At the conclusion of my last article, I find that I committed an error in consequence of having inadvertently followed Mr. Fox's essay; by stating that the axis of the arch, to which the beds of all the stones ought to point, was the centre of the circle of which the surface of the centering was the circumference. This is not, *strictly speaking*, correct; for it will be obvious to the attentive observer, that as all the stones are drawn at right angles to a tangent of the ellipse, those stones which are nearest to the base of the arch will have a centre higher up in the arch than those at the crown; as every person acquainted with an ellipse well knows. As however, all parts of the beds of the stones must be at right angles to the tangent of the curve of the arch, this correction will at once be self-evident to the reader.

The situation of the cross joints, is the next thing which demands our attention. When an arch is built entirely of stone, the courses will all run in parallel lines, as indicated by the dotted lines at S, fig. 11; and the situation of the cross joints will therefore be of little importance, provided that no two joints are made to come together. As however, the majority of skew arches are constructed of brick with stone fronts, the cross joints then become of greater moment; as it is always desirable to obtain an equality of pressure, by making the bearing surfaces of the stones as nearly as possible of an equal area. If the soffits of all the stones are of the same length, the bearing surfaces will be very unequal; as will be evident from an inspection of the diagram fig. 7, the beds of the stones being indicated by the letters A A. In Mr. Fox's essay, this evil is proposed to be remedied by making the beds of the stones of equal length in the middle, as shown in fig. 8, where the *equal* lengths are indicated by the dotted lines. This plan however is liable to some objections. In the construction of a brick arch with stone fronts, the most common method is, to make the soffits of all the stones forming the face of the arch alternately long and short; not only because this presents the best appearance from beneath, but likewise because the stone and brick-work become thereby more firmly united. If therefore two lengths be determined upon, for the soffits of the stones to the depth of about one brick, the upper part may be cut into any form which the builder may think most proper to obtain as nearly as possible an equality of area for the bed of the stones; and the appearance will thus be improved.

The skew backs next come under our notice. In a straight arch, the springing courses of the abutments are *of course* parallel to the horizontal courses; but in a skew arch, they are cut in notches resembling the teeth of a saw. The size of each of these skew backs is of little importance; but if the arch is to be built of brick, the shortest side of each ought to be equal to a certain number of courses of brick-work; and the courses must be at right angles to the approximate line *a. b.* fig. 11. Fig. 9 represents part of the abutment of a skew arch, with the skew backs cut each equal to three courses of brick-work.

Fig. 7.

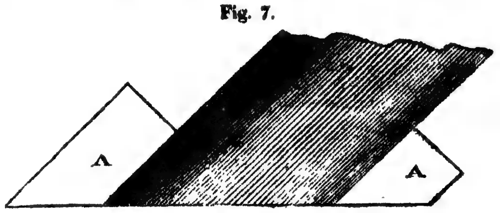


Fig. 8.

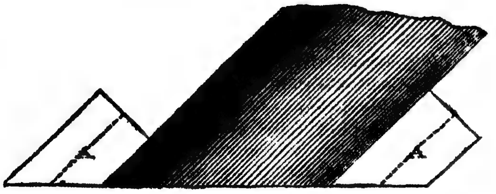


Fig. 9.

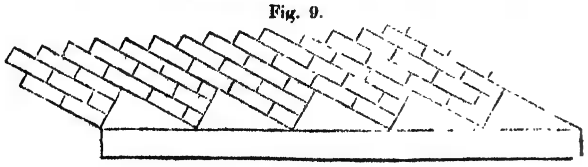


Fig. 10.

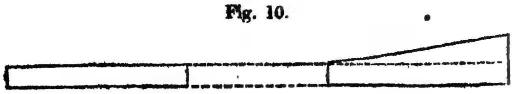
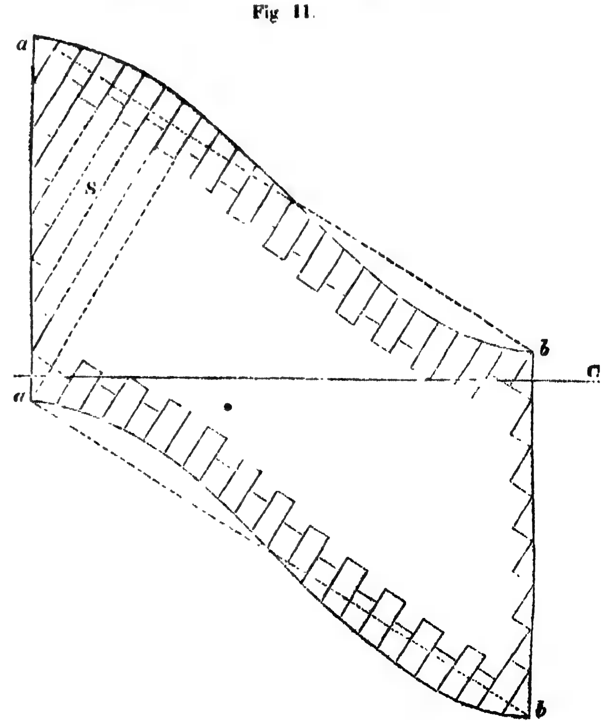


Fig 11.



The mode of working the winding beds of the stones, as described by Mr. Fox, is well worthy of adoption both on account of its simplicity and its certainty. As his essay may not be in the hands of all your readers, I may perhaps be permitted to transcribe it in the author's own words. "Having provided two straight edges, the one parallel, and the other containing the angle of the twist (see fig. 10), we proceed to work one of the beds, by chiseling two draughts along the stone, so that these straight edges being kept at a proper distance from each other are let into the stone, until they are out of winding on their upper edges. Having finished one bed by means of straight edges, we then obtain the soffits and the other bed by means of a square, one limb of which is made the curvature of the soffit, and the other the radius of this curve."

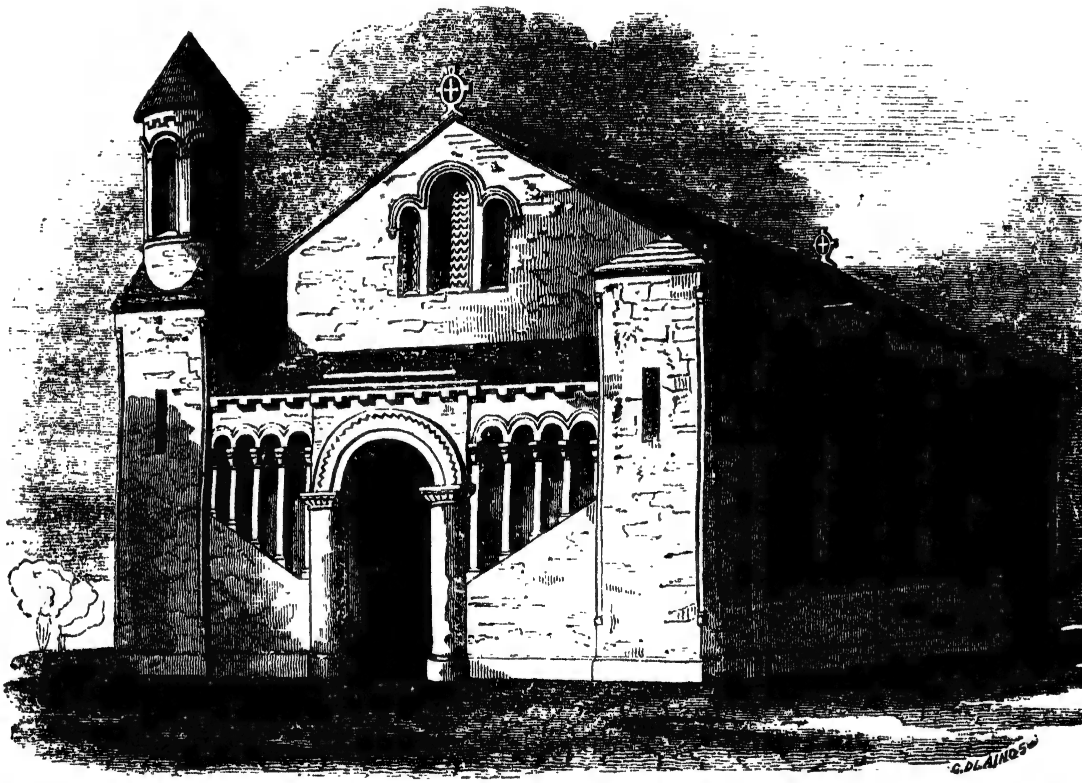
Fig. 11 represents the soffit of a skew arch unfolded, the angle being 45 deg. In this diagram, the skew backs are each made of the same width as the voussoirs, as must be the case if the arch is built entirely of stone; when the interior of the arch is of brick-work, this (as before observed) is not of much importance. If this figure be bent round to an exact semicircle, it will represent the whole of a soffit of a skew arch, at an angle of 45 deg. The line C C is merely intended to show by comparison the analogy between this diagram and the one marked D, fig. 3, page 279.

In the construction of these arches, some masons prefer dressing the face of the stones after the arch is erected; as thereby any little irregularity in the arch stones may be corrected more easily.

To those builders who are unacquainted with this subject, a small model will prove more useful than the most elaborate description. The centering may be formed of a piece of stiff pasteboard; and the voussoirs cut out of cork or soft wood; and if constructed agreeably to the rules here laid down, it will render the subject both simple and interesting to every practical man desirous of becoming acquainted with the more difficult and scientific parts of his profession. C. L. O.

CHAPEL ABOUT TO BE ERECTED NEAR CARDIFF.

BENJAMIN FERREY, ESQ. ARCHITECT.



This chapel which is about to be erected by the Marquis of Bute, in the immediate vicinity of Cardiff, from the designs of Benjamin Ferrey, Esq., although upon a small scale (about 70×35 feet), and sufficiently economical in regard to decoration, is marked by considerable piquancy of character and architectural effect. As the design of the exterior is sufficiently explained by the wood cut engraving, there is no occasion for our saying any thing in the way of description; we shall therefore merely call attention to the pleasing combination of the front; and to those no less novel than strikingly happy features, the open staircase galleries, which, with the porch, form the lower centre compartment.

It is true, the idea is borrowed from a similar staircase in the conventual buildings at Canterbury; but this is, we believe, the very first application that has been made of it in modern times; and it is so exceedingly appropriate and characteristic, that the merit of thus transferring to actual purpose what had hitherto been allowed to lie *fallow* for such a length of time, manifests a felicity in appropriation, which certainly is not possessed by every architect. We trust, however, that although it is the first, it will not prove the last modern instance, of staircases leading to the galleries of churches, being so placed, and thus made to conduce very strikingly to exterior design.

We are fully persuaded that staircases so planned would be found to admit of very great diversity; and might with a little study be adapted to the exigencies of every style,—of Grecian no less than of Gothic. Wherefore the gallery staircases in churches should hitherto have been invariably enclosed, it would be difficult to account for, otherwise than by attributing it to the inveteracy of custom, the jealousy of established prejudices, and the timid reluctance to attempt anything that the ignorant may consider odd. It appears to us, that so far from there being anything incongruous or inconvenient in open staircases to such buildings, they recommend themselves by being exclusively adapted to them; and consequently as conferring an appropriate distinction which no other buildings admit of. Staircases of this description would be highly objectionable, and therefore highly absurd, not only in dwelling-houses, but almost every other kind of public buildings except churches and chapels. But there, they no more require to be enclosed or concealed, than does either a porch or portico. Perhaps, indeed, the Church Commissioners might object to such arrangement; it is therefore fortunate that on this occasion Mr. Ferrey has had nothing to do with them, nor been obliged to accommodate his design to the Procrustes bed of their regulations.

Some may probably be of opinion that it would have been better had there been either two turrets, or a central one. Yet in this respect the deviation from perfect symmetry, hardly amounts to a fault; because in very small buildings of this style, perfect regularity is apt to produce an air of formality, and to make the structure appear smaller than it otherwise would. However, we understand that there is some intention of erecting a corresponding turret at the South-West angle of the front, at some future time. The building is to be constructed of rough stone, with its details executed in moulded brick or terra-cotta.

IRON SUSPENSION BRIDGE ACROSS KENMARE SOUND, IRELAND,

DESIGNED BY WILLIAM BALD F.R.S.E.; M.R.I.A. &c. &c. CIVIL ENGINEER.

Fig. 1.—Elevation.

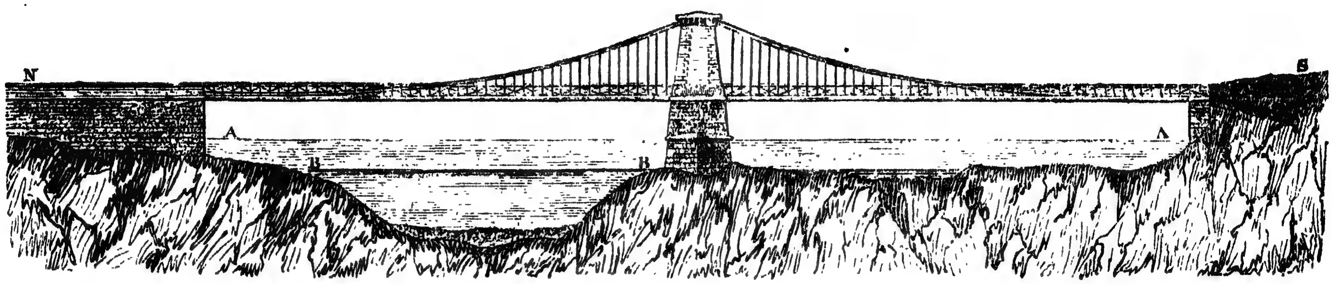
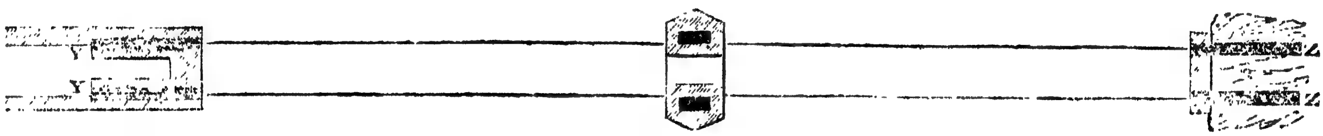


Fig. 2.—Plan.



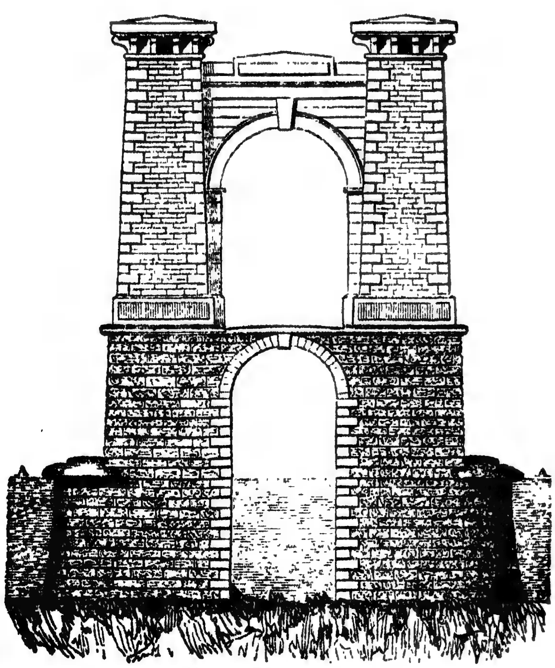
Scale of Feet to Figs. 1 and 2.

10 0 50 100 150 200 250 300

GENERAL REFERENCES.

A A, High-water spring tides.—B B, Low-water spring tides.—N, North end, and S, South end of Bridge.—Y, Y, fastening of Chains at North, and Z, Z, at South end of Bridge.

Fig. 3.—Elevation of Tower of Suspension.



Scale of Feet to Fig 3.

10 0 10 20 30 40

Fig 4.—Section of Tunnel at South end of Bridge, showing mode of securing Chains.

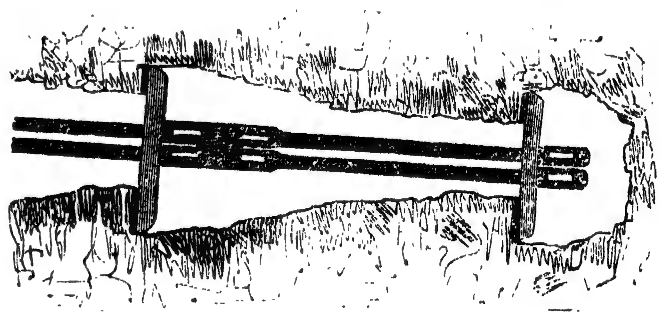


Fig. 5.—Main Chains; Side View.

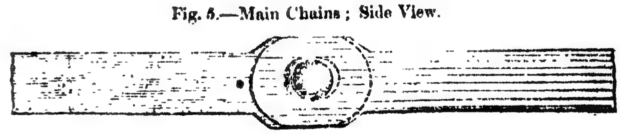
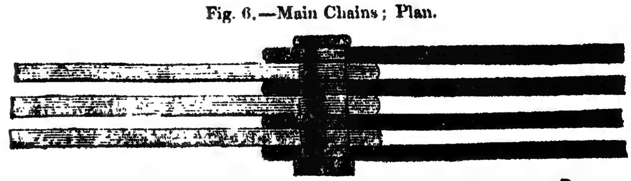


Fig. 6.—Main Chains; Plan.



SUSPENSION BRIDGE OVER KENMARE SOUND.

The situation of the proposed bridge over the Sound of Kenmare, is about three quarters of a mile from the town of Kenmare, in the County of Kerry, and on the South-west coast of Ireland. It is on the new road now in course of construction, between the town of Kenmare, and Glengarriff on Bantry Bay; which when finished, will open to the traveller one of the most beautiful and interesting portions of Ireland. It will pass through four galleries, three of which are already completed; and the remaining one which is the largest, being about two hundred yards long, will be open in November next. The floor of this last tunnel, is elevated one thousand feet above the level of the sea. They all run through strata of solid rock, portions of which are extremely indurated. This road was designed and laid out by Mr. Bald, and it has now nearly reached its completion, under the direction of the Board of Works in Ireland. A further account of it, with its tunnels, bridges, &c. will probably be given hereafter.

The sound of Kenmare, at high water spring tides, is about four hundred and fifty feet wide; and at low water, about one hundred and twenty-five: it varies in depth from twenty-one to twenty-seven feet. Above the town of Kenmare, the estuary extends about a mile and a half; it is about a quarter of a mile broad, and is nearly dry at low water spring tides. Two large rivers flow into it, passing outwards through the Straits or Sound of Kenmare; through which the current runs strong at half tide flood and ebb. Nearly in the centre of this strait, is a rock, called Carrig-buiy, or the yellow rock, on which the tower of suspension is to be built. The bottom and sides of Kenmare Sound consist of transition slate rock, lying in thin beds traversed by veins of quartz, whose dip is nearly vertical. This rock varies very much in its induration, being in some places very soft, and in others very hard. Within a very short distance of the Sound, is to be found compact hard grey limestone in great abundance, in beds of various thickness; it is an excellent material for building, and will be used in constructing the tower of suspension, and the wing walls of the bridge.

The dimensions of the tower of suspension (fig. 3) will be at the base thirty-six feet long by twenty-one feet broad; at the top on each side of the roadway arch, ten feet by seven feet; the total height will be about sixty feet above low water. The elevation of the tower is designed by Mr. Barry. The roadway is to be eighteen feet wide; and the archway through the tower, twelve feet wide. The length of suspended roadway platform on each side of the tower, will be one hundred and sixty-five feet, containing an area of five thousand nine hundred and forty feet. $(165 + 165 \times 18 = 5940.)$ Taking the weight on a superficial foot of the suspended roadway at sixty pounds,* there will be $\left(\frac{5940 \times 60}{2240} = 159\right)$ one hundred and fifty-nine tons on the suspended roadway when loaded.

There are to be four main chains (figs. 5. 6.) on each side, five inches deep by 1.30 inches thick; which will give a sectional area of fifty-two inches $(1.30 \times 5 \times 4 = 26 \times 2 = 52)$. By the experiments of Sir Samuel Brown, Mr. Brunel, and Mr. Telford, the direct cohesion of an iron bar one inch square, was found to be 25, 29, and 31 tons, respectively; but the strength of iron for suspension bridges has usually been taken at only ten tons to one square inch of sectional area. Then, fifty-two square inches would bear five hundred and twenty tons. The tension and weight of the iron in the main chains, &c. are not allowed for; but a sectional area of fifty-two inches in the main chains is quite sufficient to sustain any load that may pass over the suspended roadway. Although a sectional area of fifty-two square inches has been recommended for the main chains, one of forty square inches only is to be adopted.

The main chains at the North end (N, fig. 1) are to pass through tunnels constructed in the middle of the wing walls, and fastened at the ends marked Y, Y (fig. 2); and on the South side (S, fig. 1) tunnels are to be cut into the solid rock, and the ends of the main chains secured at Z Z (fig. 2.) The mode of fastening the chains is shown on a larger scale, in fig. 4; it is the same as that proposed to be adopted by Mr. Brunel at the Clifton Suspension Bridge.

The iron-work of this bridge has been contracted for by Sir Samuel Brown; and the masonry of the tower of suspension and wing walls will be executed by the Board of Works. Mr. Bald estimated this work at about 6,000*l.*; and Sir Samuel Brown offered to complete the whole, including iron and masonry, for 6,150*l.*

Several designs were made by Mr. Bald, and the one contracted for, is not quite so wide as the one here shown; it consists of two semi-catenarian curves, each one hundred and thirty-four feet wide. The design here given is the same except the difference just mentioned; and as before stated, consists of two semi-catenarian curves, each one hundred and sixty-five feet wide. It economizes the masonry to a very great extent, and gives much more water-way to the strong ascending and descending tidal current of the Kenmare estuary.

We have been favoured with an inspection of several designs by Mr. Bald, for the bridge over Kenmare Sound; the first of them consisted of an arch one hundred and thirty feet span; with three other arches, each forty-one feet span. The second design consisted of five arches, each seventy feet span; one of the piers for which was proposed to be built with the diving bell, in a depth of thirty-eight feet of water at high tide. The third consisted of an arch of timber, one hundred and thirty feet span; and four stone arches, each fifty feet span. The fourth design consisted of five arches, each fifty-five feet span; and three Gothic elliptic arches, each thirty-six feet span resting on inverts laid on rubble stone filling; it being proposed to fill the Sound up to the level of low water spring tide.

All these designs have been carefully examined both by Mr. Brunel the engineer of the Thames Tunnel, and by Mr. Alexander Gibb, one of the most skilful and practical bridge builders in the empire; and they have been unanimous in stating their opinion, that on account of the limited funds for this work (6,000*l.*), it would be best to adopt the third design, consisting of one single arch of wood, one hundred and thirty feet span, and four stone arches each fifty feet span.

We should have been very glad to exhibit all these designs; but our columns are so fully occupied, that it is not in our power to do so. The design we have given, is the one approved of by the Board of Works in Ireland; and the Marquis of Lansdowne has in the most liberal manner contributed towards the expense of this most useful public work, a sum of 3,000*l.* We understand that the same nobleman on a former occasion, contributed towards the building of the new bridge of Limerick, a sum of either 6,000*l.* or 10,000*l.*

The various designs which we have mentioned, exhibit great industry and attention on the part of Mr. Bald, in investigating the best and cheapest mode of erecting a bridge over Kenmare Sound. It will be seen that they are of very various materials and constructions. Thus besides accomplishing the immediate object in view, he has drawn the attention of many eminent practical engineers to the subject of the comparative merits of the different plans. Many engineers would, we have no doubt, have proposed bridges for this situation, that would have cost as much as twenty or thirty thousand pounds; thus involving the parties in ruinous expense, or even causing the total abandonment of the intention of erecting a bridge at all.

One more design, much resembling Mr. Bald's first, is given in the following letter from Messrs. John and Thomas Smith of Scotland, architects; which is so full of good sense, that we willingly give it insertion. It is particularly deserving of serious consideration, as being the letter of practical builders, who have executed many bridges so extremely cheap, and with very inferior material,—some of them seventy feet span for a few hundred pounds,*—that their system of bridge building should be every where adopted by working engineers. The abundance of fine flat bedded limestone and slate flags, to be found at Kenmare Sound, offers great facilities for the construction of a bridge there according to the principles of the Messrs. Smith; and it is much to be regretted that any kind of bridge but one of stone, was thought of or adopted. Indeed the slate districts of Ireland generally, offer abundance of excellent material for bridge arching, as recommended and so successfully practised by the Messrs. Smith.

Darwick, November 8, 1837.

Sir,—We received your favour of the 23rd ult. respecting your proposed bridge. We cannot help thinking that under such favourable circumstances for building a stone bridge, you ought never to think of any other. You mention that one arch of 130 feet will be sufficient for waterway; if this is the case would it not be best to build only one arch, and to substitute a mound at the South end, in place of walls or small arches? The mound might be protected from the action of the water, by facing it up on each side with strong pavement to the height of the highest tide; which might be done at a small expense. We have annexed a sketch of such a bridge (fig. 7), which if *economically conducted* we think might be done for somewhere about 2,700*l.*

To execute a chain bridge upon your plan, would require fully as much money. We are, Sir, your most obedient servants,

John and Thomas Smith.

To William Bald, Esq., Engineer, Dublin.

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* In France, the load on the roadway of suspension bridges is taken at from forty-one to forty-eight pounds per superficial foot.

* A bridge consisting of two arches each 51 ft. span, and one of 26 ft. span, cost 1,300*l.*

Bridge over the River Tweed, two arches of [illegible]½ ft. and one of 26 ft. cost 920*l.*

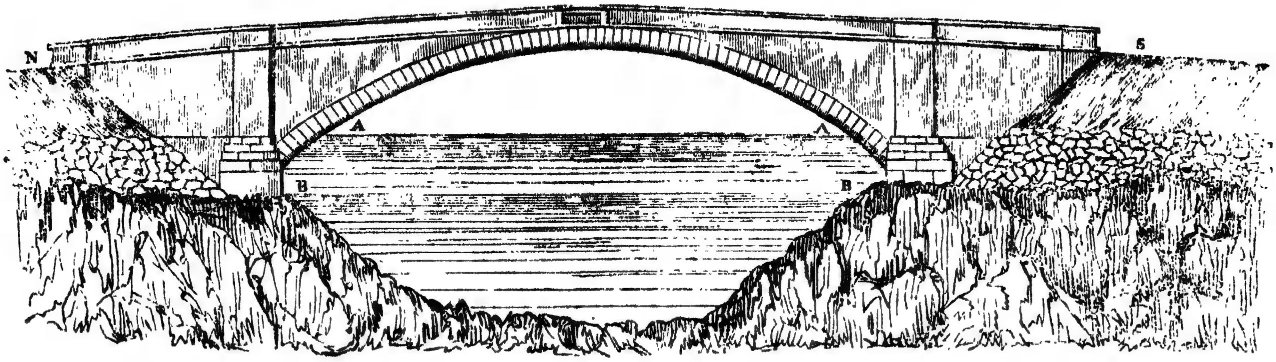
Bridge over the Hermitage Water in Liddesdale, one rubble arch of [illegible] ft. span, cost 400*l.*

Bridge over the Yarrow, at Yarrow Kirk in Selkirkshire, one arch 63½ ft. span, cost about 360*l.*

The largest arch of rubble whinstone, is built over the Ettrick at Falshope; span 76 ft. 4 in. The estimate for this bridge, the coping of the parapets and the digging of the foundations excepted, was 360*l.*

Extracted from the Transactions of the Institute of British Architects of London, Vol. I., Part I.

Fig. 7.—Elevation of Bridge over Kenmare Sound, proposed by Messrs. J. and T. Smith of Darwick.



Scale of Feet to Fig. 7.

10 0 50 100 150

To these many and various plans, we add one suggestion; that as the tidal estuary of Kenmare Sound extends for nearly two miles above the site of the proposed bridge, it might have been desirable to preserve this navigation to the small coasting masted vessels of the district, by constructing the bridge so as to draw aside and allow them to pass at the deepest part of the sound.

In conclusion, we repeat our expression of regret that a stone bridge has not been adopted, in preference to an iron suspension one. For it would not be liable to those accidents to which works of that kind are exposed; nor would it need that constant attention and those expensive repairs which suspension bridges always require. The insecurity of suspension bridges as exhibited in the many accidents which have taken place; the vibratory motion to which they are subject during gales of wind, and also when heavy loads pass over them, causing a gradual diminution of their strength and stability; ought to determine the engineer never to adopt them under any circumstances, if he possibly can avoid it. Stone bridges decidedly recommend themselves by their strength and durability, and by the circumstance that when properly built they hardly ever cost anything for repairs. In their material and structure, Waterloo and London bridges carry the impress of duration to an almost indefinite length of time; they are besides, magnificent monuments of national glory, the works of a great and a noble minded people, and justly excite the admiration of strangers from all parts of the world, as truly proud monuments of engineering science. In the course of time when the material of the suspension portion of the Menai Bridge, shall have perished, and been consigned to ruin, and worn to dust by the destroying powers of the atmospheric agents; the granite bridges of London and Waterloo will then exist in the same freshness and vigour of duration as that in which travellers now find the ancient granite monuments of Egypt, after a lapse of more than thirty centuries. The sight of these magnificent bridges will always inspire high-minded men with veneration for the genius and talent of Rennie, who planned and executed those noble works; which justly confer celebritry on his name, and will ever rank it high among those which adorn the pages of the history of scientific engineering.

THE VICTORIA HULL STEAM-SHIP.

CORONER'S INQUEST, CONCLUDED.—VERDICT OF THE JURY.

This long-continued inquiry having at length reached its conclusion,—at least in the Coroner's Court; for we see that the proprietors of the Victoria have taken measures to remove it into the Court of Queen's Bench,—we hasten, as far as our limited space will permit, to complete our account of its proceedings.

On Tuesday July 31st, the first witness examined was Mr. Barth, an operative chemist and lecturer, who favoured the jury with an exposition of a theory previously propounded by him on the bursting of boilers, and which he considered applicable to the present case. He attributed the explosion to the decomposition of the steam, and the consequent generation of gases, forming an explosive mixture. For this theory, and the experiments made by Mr. Barth; and for some similar ones also detailed by another witness named Collick, as to the possibility of the water being blown out of the narrow spaces as some imagined it was,—we must refer the curious to the full report in the daily papers.

Several other practical engineers were examined; and the proceedings of the day concluded with the following evidence from Mr. Field,—which we are tempted to give entire.

Mr. Joshua Field, of the firm of Maudslay and Field, engineers and steam-engine makers, of Lambeth, was then sworn, and gave the following evidence:—Having been summoned by a warrant from the coroner for the county of Middlesex to give evidence on the case of the explosion which took place in the Hull steamer, Victoria, on the 14th of June last, I have been on board that vessel to make the examinations necessary to enable me to form a judgment on the matter. On going into the boilers and passing through the flues, I found that the fire-tube of the starboard outside boiler had collapsed to a very great extent, and had become fractured, so as to let the water escape, thus producing the loss of life which is the subject of the present inquiry. As the form and dimensions of these boilers have been accurately described by gentlemen who have been previously examined, it will be unnecessary to detain the jury by adverting to that part of the subject again I shall therefore proceed at once to state my opinion as to the cause of the explosion, and make some remarks as to the construction and arrangement of these boilers. The immediate cause of the accident appears to me to have been, that the strength of the fire tube, from its large diameter and insufficient thickness, was incable of bearing the pressure of steam and water to which it was exposed. I have examined the safety valves, and find that with all the weights on, they were loaded to 13lbs. on the square inch, to which must be added the statical pressure of the water in the boilers, which is equal to about 3lbs. more, acting on the lower part of the tube, about 15 lbs. on the middle, and 14 lbs. on the top; thus taking the mean pressure of 15 lbs. on the square inch, the fire tube, which is 6 feet in diameter and very little more than a quarter of an inch thick, had to sustain a pressure of 2,160 lbs. on every square foot of the surface, and every ring or hoop of it a foot wide had to sustain 17 tons, and on the entire length it had to bear 629 tons; such a pressure could only be sustained so long as the tube retained a perfectly cylindrical figure, and whilst the pressure and strength remained uniform throughout the circle. The pressure, as we have seen above, was not equal by fully two pounds on the square inch. So soon, therefore, as the tube departs from the true cylindrical figure the key of the arch is disturbed, and an immediate collapse takes place. This, I think, is of itself sufficient to account for such a collapse having happened, which may also have been aided by other causes. I could not obtain any certain evidence to the state of the water in the boilers at the time of the accident; but, from an examination of the plates at the fractured part, I should not judge that they had been red hot, and it is clear that the lowest part in which the greatest rupture has taken place would not become red hot until the boiler was entirely empty; and, had this been the case, the upper part must have been red hot for a long time, and would show evidence of that having been the case. The surfaces in the steam chambers, which stand on the boilers from which the steam disengages itself from the water, are divided into twenty compartments, and the total area of them is small compared with the size of the boilers and the quantity of steam rising in them; the ebullition is thereby increased, and this must render the water-line undefined, and make it difficult to keep the feed regular and uniform as in ordinary boilers, where the steam rises from the entire surface. The water spaces, especially at the sides of the fires, are the most contracted I have ever seen, being only 2½ inches; whilst the fireplaces are the largest, being six feet wide by eight feet six inches long. This renders the circulation of the water through these spaces confused and imperfect. The fire, after passing through the large fire-tube above alluded to, is caused to descend through an oblique opening into the space between it and the neighbouring boiler, and passes back the whole length of the boiler between the bottom of the boiler and the bottom of the ship into the chimney, situated at the front, and between the two centre fire-doors. This return flue is formed of plate iron, paved with brick, which arrangement I cannot help pointing out as very dangerous and quite unusual, being very likely to set fire to the vessel. The coals are not stowed in iron cases over the boilers, and detached from them, but lie immediately on the boilers, and consequently for several hundred square feet they are within five or six inches of the most intense part of the flame, insulated, it is true, by the water in a high state of ebullition, when all is going right; but should the water, from any cause become low, these coals would inevitably take fire.

On Tuesday the 14th ult., the only survivor of the men employed about the engine, John Cardinow, the third engineer, for whose recovery the jury had long been waiting, was brought forward to give his evidence. The following extracts seem important, as tending to throw light on the causes of the accident and the practical working of the boilers:—

The feed-cocks were not shut before the collision took place. I shut the feed-cocks off myself at the time, and I'm quite sure they were not turned off before. Neither I nor the other engineers had been pinching the boilers; we had been regulating them. * * He was in the habit, with the other engineers, of regulating the feed; and as the midship boilers would be supplied in their working from the wing boilers, the feed was generally turned nearly off in the midship boilers, whilst they were kept fully open in the wing boilers. This was the case with them when the collision took place, and he turned the feeds off.

Mr. Hall: Was this a regular mode of working boilers?

Witness: Certainly not, but these boilers needed great attention, and required to be worked in this way. * *

Mr. Hall: Did you think there was any danger in working these boilers?

Witness: I was always in bodily fear, but I thought there was no real danger when there was plenty of water in the boilers. The other engineers had the same feeling. We were always examining them, every three minutes at most, and have known the water to lower from the top gauge to the second, in less than five minutes.

There seems to have been some misapprehension respecting the proper height of the water-line; from Mr. Hall's questions, it appeared that he considered it to be, between the 2nd and 3rd gauge cocks; while from Cardinow's answers, it was plain that the actual working line had been understood to be, between the 1st and the 2nd. There was also a strange diversity between the evidence of Mr. Craig, an engineer produced by Mr. Hall, who stated positively that he had been employed by the proprietors for the purpose of instructing the men in the proper feeding of the boilers, and had instructed Cardinow among the rest; and that of Cardinow who stated, "I am sure he gave me no instructions: I do not know what he might have said to the other engineers."

The following extract strongly confirms Mr. Field's opinion of the effect of the narrow water-spaces to be "to render the circulation confused and imperfect:"—

I was never certain how much water there was in the boilers. The solid body of water being nearly as low as the lowest gauge-cock, would bubble up to the highest gauge-cock, and we could not tell where the water was.

Our readers have now before them the evidence of several eminent engineers, complete; fairly selected from the mass accumulated by the jury, and illustrated by a few facts from Cardinow's examination. We have further to record only the verdict, which was delivered at half past one o'clock in the morning of the 15th.

The jury consider that the death of Andrew Brown was accidentally occasioned by the explosion of the boiler on board the Victoria steam-vessel, on the 14th of June last. The jury consider that the construction of the boilers was unsafe, the water spaces too small, and the plates too thin. The jury further consider, that the engineers having no immediate control over the safety-valve in the engine-room is highly reprehensible; and the jury levy a deodand of 1,500*l.* upon the boiler and steam engine of the Victoria.

The inquest having been taken on only one body, the jury had two more sittings, merely as a matter of legal form; which on their account we regret, as their patience had been already but too much tried. And as these additional adjournments, whatever they did in point of law, did nothing further in point of common sense, or of engineering information;—we consider the case complete without any report of them.

THE POLYTECHNIC INSTITUTION, REGENT STREET.

This new Gallery of Science, which was opened on the 6th of August, is an exceedingly interesting establishment; and promises to be one of very great utility, in bringing before the public a variety of ingenious and meritorious inventions, both in the mechanical sciences, and the decorative arts. The curiosity of the most listless can hardly fail to be provoked to examination and inquiry, by the models and specimens of every kind, which are here to be seen. As a very excellent catalogue may be had at the doors, which gives full particulars of all the most remarkable objects, we shall not attempt any enumeration of them, but merely mention one or two of the most striking things in the exhibition.

Foremost in the sorcery of mechanic art, is that of cooking meat at one end of the room by a fire before a reflector at the opposite one,—that is at about the distance of one hundred feet; the heat from the reflector before which the fire is placed, being concentrated by another reflector in the opposite gallery, and thrown upon the meat. These reflectors serve also to convey sound; so that a person who whispers against one of them may be distinctly heard by another, who places his ear against the opposite one.

The process adopted for raising vessels sunk at sea, is also an interesting exhibition; while the diving-bell may not only be seen in operation, but those who like to make the experiment may descend in it. When we were there, many of the company did so, and among the rest some ladies; but how they relished the descent we are unable to say.

Among the works of art, we noticed a plaster statue coated with composition so as to resemble marble; which it imitates so well, that unless the process adds materially to the cost, it is likely to be pretty generally adopted for all kinds of plaster coats. There are also several beautiful specimens of tables inlaid with different coloured woods, others of inlaid flooring or parquetry. Among specimens of this class are some very admirable ones of paper for rooms, in imitation of the most delicate veined marbles of different colours. We only regretted that a practical application of them for decorative purposes, had not been shown, by introducing ornamental surfaces of this kind into some of the panels and compartments of the architecture of the room itself; more especially as a little ornamental colouring would greatly aid the general effect.

The large Hall or Museum, to which there is an ascent from the entrance hall by a short flight of steps, is 120 feet by 40, and 40 high; and lighted very much after the manner of the Pantheon Bazaar, by a series of fourteen windows on each side, in the curve of the ceiling. The covered part of the latter, is divided by bands into 21 large square compartments, viz., 7 in its length, and 3 in its breadth. There is also a semicircular window at each end, that at the East opening into an upper room appropriated as a bazaar for the sale of fancy articles. The staircase is simple, but of very pleasing character. This leads to a spacious semicircular theatre in the upper part of the front building, where we behold the wonders of the Hydro-oxygen Microscope.

OBSERVATIONS ON ROMAN CEMENT.

Sir,—Your excellent correspondent C. L. O., in his useful article on "Building Materials," inserted in your last number (p. 244), has fallen into some errors in his remarks on cement. His observation that "the article commonly called Roman cement, which for many years was extensively used throughout the kingdom, is now partially superseded by the introduction of other substances," is totally incorrect; its use is at the present moment at least ten times greater,—perhaps fifty fold greater,—than at any former period, and there is no other substance in any degree worth notice used in competition with it.

Your correspondent is mistaken in asserting that the "blue lias when used as stucco is certainly superior to Roman cement," excepting that its colour is somewhat better. All he says in its favour is erroneous; and so is his observation, that "Roman cement is never so good as when it was first introduced." If he will apply to the original patentees, and will pay the price demanded (considerably less than formerly), he may obtain Roman cement of as good quality as ever it was; but the real truth is, that great quantities of the cement now offered for sale, do not contain a particle of Sheppy stone, of which it was originally wholly manufactured; at the same time it should be mentioned that all the stone is not good that comes from that island. The Sheppy stone varies in quality, as much as your correspondent justly states the Roman cement does both in quality and price. The genuine Roman cement is not always very dark in its colour, as C. L. O. states it to be; indeed it is generally much lighter than the kind manufactured from Harwich and other stone; and it is therefore the practice of some manufacturers to mix Swalecliff and other light-coloured stone with the Harwich stone, to give that cement the lighter colour of the genuine cement. They thus depreciate the quality of the cement made from the Harwich stone, as the Swalecliff stone although it lightens the colour of the cement, and causes it to set quickly, as the genuine cement does, has the quality also of "giving" after it has set, as it is technically called; that is to say, becoming loose and soft, and falling off. The genuine cement is in many instances used without sand, particularly in tide and other aquatic work. It was so used lately in repairing the London Docks, and is so at the present time in the Tunnel. It is seldom employed as a stucco for facing buildings, with less than three parts of sand to one of cement; in which case, if laid on by a skilful workman, it is not "very liable to crack in drying." A skilful workman is very essential to the successful application of the genuine cement.

Your correspondent says that except when mixed with great care, it can seldom be made to bear a very smooth face; the smoothness of its surface, when used as a stucco, depends more upon the texture of the sand, and the care exercised in hand-floating it while setting, than the mixing of it.

Your correspondent says that Atkinson's cement is very similar in quality to Roman cement. The following is the analysis of both, by Sir Humphry Davy:—

Parker's Cement. 100 grains contain		Atkinson's Cement. 100 grains contain	
Silex	22	Silex	21
Alumina	9	Alumina	7·5
Oxide of Iron and Manganese	13	Oxide of Iron and Manganese	13·5
Carbonate of Lime	55	Carbonate of Lime	55
	99		97
Loss by heating	3·25	Loss by heating	3·32
	102·25		100·82

Yours, &c.,

London, 25th July, 1838. H. N.

THE WELLINGTON CHAPEL; REPLY TO J. H.'s CRITIQUE.

Sir,—Your correspondent J. H. has been pleased to notice the Wellington Chapel in the last month's Journal (p. 247); and to deprecate as much as lay in the power of an uninformed critic the abilities of the unknown artist, or whatever he may choose to designate him, who designed it. That the building is in strict conformity with the models of Greece, I do not pretend to assert; the deviations may be great, and some of them reprehensible. At the same time a barrack is not a palace; nor a barrack chapel a Parthenon;—and I must think it somewhat illiberal in a person so highly gifted with the capacities of architectural judgment as Mr. J. H. would appear to be, to pour his execrations upon the efforts of an individual against whom he can have no

direct animosity, and with whom he professes to have no acquaintance, as being employed in the execution of a building which is far superior to those generally constructed in barracks,—though not a copy of the antique, or the beau ideal of Mr. J. H.'s imaginations.

It may be, that the person employed, laboured under disadvantages to which Mr. J. H. may thank Heaven that he has been a stranger; and perhaps he had difficulties of situation to encounter which Mr. J. H. would have combated with less spirit. Be this as it may, the building is no discredit to its author; nor can I think that a Smirke, a Barry, or a Cockerill, or even an Ictinus or a Callicrates (with whose names Mr. J. H., "unknown to fame," seems so slavishly familiar), with all their acquired reputation and ambition, would stoop to envy the celebrity that might have been acquired by a less humble, but more authorized professor of the art, in the execution of such a building and for such a purpose. Far be it from me to dispute the right of critical observation which Mr. J. H. claims to himself; had he allowed the venom of his indignation to flow only on the walls of the chapel, I should not have troubled myself by noticing his remarks: but when he would level his sarcasm rather against the "uneducated" author, than against the public building which he magniloquently claims a "public right" to judge, I must step forward and ask his criticismship to forbear. By what right of profession, of celebrity, or of education, does Mr. J. H. arrogate to himself the denunciation of an individual whom he supposes not to be possessed of these indispensable distinctions? Does Mr. J. H. imagine, in the height of his architectural conceits, that no one but he who has been indentured in an architect's office can possibly become an architect?—that none but such as have mis spent six or seven years of valuable time in contemplating a drawing-board, and then wandering in search of the Pantheon or the Acropolis, can make a design? I cannot suppose him so senseless; nor would I insult his understanding, by telling him that it is possible for genius to raise itself by its own exertions; or that there really have been instances of the kind.

For my own part, I am an ignorant, unprofessional, and unlettered man, Mr. Editor; but I still claim the use of your Journal as an arena in which Truth shall be properly asserted; where works of architecture may be honestly criticised, but not characters aspersed; where talent, however humble and uneducated, may obtain an equitable sentence; but where vain or bigotted presumption shall meet with fitting castigation, and where personal calumny or detraction shall never usurp the seat of calm and dispassionate criticism.

Yours, &c.,

July 27th, 1838. A SUBSCRIBER.

[In compliance with the request of our correspondent, we insert his letter at the earliest opportunity; though we acknowledge that in this case as in numberless others that are constantly coming before us, we think the complaining party would do better to keep silence, unless he is prepared to overthrow the criticism of which he complains. We have carefully read over again J. H.'s critique on the Wellington Chapel; and we really do not see that our "Subscriber" has any just cause of complaint. J. H. points out certain deviations from classical authorities;—our correspondent "does not pretend to assert that the building is in strict conformity with the models of Greece." J. H., who appears to be altogether devoted to classical models, conceives that deviations such as those pointed out, could not have proceeded from a regularly educated person; our correspondent confesses to being "an ignorant, unprofessional, and unlettered man," though we must acknowledge the style of his letter compels us to take his assertion not quite literally. We think our correspondent would have done better, under the circumstances, either to be silent, or to meet J. H.'s criticism by a discussion of the principles on which it is based; by a free and full inquiry into the necessity or desirableness of using classical models for modern architecture, and the extent to which they may or must be modified in this adaptation,—a question on both sides of which there is a good deal to be said.—Ed.]

REMARKS ON STEAM ENGINE FURNACES BURNING THEIR OWN SMOKE.

Sir,—I beg to recommend to your consideration, a subject for the Journal, viz., the consuming of the smoke of steam engine furnaces. It is one which, from their great number throughout the kingdom, is next in importance to that of railways. Besides which, it is still new and fresh, which the other is not; for although some trials have been made at manufactories to burn the smoke, they have not succeeded; and the attempt is now given up, or rather not thought of, the thing being deemed impracticable. Instead of it, huge brick chimneys are erected; but the only effect of these, though not so intended, is to carry the smoke away from the manufactories, to places in their vicinity, which otherwise would not be annoyed, except from such unsightly objects being continually in view, rendered doubly offensive from being surmounted with a mass of smoke.

In Blackwood's magazine for December last, page 806, mention is made of a new and successful invention by a Mr. Coad, for burning smoke; and in the Journal No. VII, page 168, you give an account of the trial of a smoke consumer invented by Chanter and Gray, and speak of it in favourable terms. If these, or either of them, or any other, be really good and useful inventions, answering the purpose professed, it is to be regretted that they are not brought prominently and repeatedly to the notice of the public, and manufacturers made aware that in fact the smoke may be consumed.

It occurs to me that for this purpose the Journal would be a fit and admirable vehicle, and would be repaid for its services by increased popularity and circulation; which is the reason of my addressing this letter to you. It is understood that if the smoke could be consumed, there would be a great saving in fuel; and as this is the consideration that would chiefly weigh with manufacturers in inducing them to make trial of the invention, the most effectual mode of informing and assuring them that it will be for their interest to do so, would be for the patentees (you and they first communicating and agreeing), to insert in the Journal from time to time, besides occasional articles, the names of manufacturers who have availed themselves of the invention, with the result as to the smoke being either totally or nearly consumed, and the saving of fuel, labour, &c.; the mention also of the patentees' charge, the expense of erection, &c. would be convenient information. This matter is clearly within the scope of the Journal, indeed so appropriate, and interesting in the probable result, that you ought to take an especial charge of it; and if it should thus come to pass, that gradually, the smoke should be consumed, and that chief of nuisances removed, an immense benefit would be conferred on the country, accompanied, it need not be doubted, with corresponding prosperity to the Journal. I hope my suggestions will be well received, and shall be glad if they are adopted.

Yours, &c. A SUBSCRIBER.

Glasgow, July 23rd, 1838.

[We willingly accede to our correspondent's proposal, and shall be happy to receive communications on this, as on other subjects of importance and interest. As however we consider it by no means a "new and fresh" subject, we beg to be understood as wishing rather for particulars of the *actual working* of apparatus for consuming smoke, than for accounts of untried and half perfected designs for this end. We remember some few years ago, finding the general feeling of the manufacturers in Lancashire strongly against the possibility of effecting the object, desirable as they admitted it to be. And this seemed to arise from the failure of attempts that had lately been made in several instances to introduce some patent contrivance;—but whose it was, we do not remember. At the Eagle foundry in Birmingham, we saw about two years since, an apparatus which had been in use most effectively, as the proprietors stated, for many years. We certainly watched in vain for any volume of smoke from the chimney, and saw nothing but a very small quantity of very inoffensive vapour. The apparatus consists of a revolving furnace, to which coal is constantly supplied in small quantities by a hopper, the engine regulating the supply. We were informed that the plan is decidedly economical; the coal not only may, but *must* be small; and the machinery needs little repair. The proprietors had furnished their contrivance to various persons in different parts of the country; and,—what appears the best test of their success,—were frequently receiving orders from the same places for more. There are probably many other inventions in use in one place or other; we just mention this which we happen to remember, as our contribution towards the fulfilment of our correspondent's wish. We hope our readers will do the same;—with this difference however, that they, describing things under their own eyes, will be able to give us *exact particulars* of the construction of the apparatus where it is successful, and the effect produced, both in saving fuel, and in preventing smoke. Various attempts are also making to introduce the anthracite coal for consumption in engine furnaces; and as this coal consists almost entirely of pure carbon, it evolves no smoke worth notice. Accurate reports of such experiments would, we doubt not, be interesting to our readers, and consequently acceptable to ourselves.—Ed.]

SUGGESTIONS FOR SUPPLYING TOWNS WITH SEA WATER.

Sir,—It has occurred to me that towns on the coast, and others not far inland, might be profitably supplied with sea-water by any company that was disposed. Taking this port as an example;—if water works were established near the river, two or three reservoirs would I think suffice to raise the supply to Olive Mount, and thence it would naturally fall to Manchester and intermediate places. For a small remuneration, the Railway company would no doubt allow the pipes to be laid on the side of the line, where they would be undisturbed, and could at any time be repaired with little inconvenience.

The advantages to be derived from such a scheme are obviously great, as through its adoption large swimming baths might be established in country places (as well as in the towns), and persons sojourning there would combine the advantages of sea-bathing with rural retirement.

In places thus supplied, invalids might enjoy on *their own* premises, without risk of cold or other drawback, a warm salt-water bath, sometimes so essential to their recovery.

This plan would not prove injurious to any "watering places;" as those who would principally have recourse to water thus supplied, would be that numerous class who have limited incomes, or are prevented by their avocations from leaving home. The wealthy and those accustomed to annual or biennial trips to the sea side would scarcely yield the pleasure of bathing in the "wide unbounded sea," or of inhaling its pure fresh breeze. K. C.

Liverpool, July 8, 1838.

AMERICAN LAWS FOR THE SECURITY OF STEAM BOILERS.

An Act authorising the appointment of persons, to test the usefulness of inventions to improve and render safe the boilers of steam-engines against explosions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the President of the United States be, and he hereby is, authorised to appoint three persons, one of whom at least shall be a man of experience and practical knowledge in the construc-

tion and use of the steam-engine, and the others, by reason of their attainments and science, shall be competent judges of the usefulness of any invention designed to detect the causes of explosion in the boilers; which said persons shall jointly examine any inventions made for the purpose of detecting the cause and preventing the explosion of boilers, that shall be presented for their consideration; and, if any one or more of such inventions or discoveries justify, in their judgment, the experiment, and the inventor desires that his invention shall be subjected to the test, then the said persons may proceed and order such preparations to be made, and such experiments to be tried as, in their judgment, may be necessary to determine the character and usefulness of any such invention.

Sec. 2. And be it further enacted, that the said board shall give notice of the time and place of their meeting to examine such inventions; and shall direct the preparations to be made, and the experiments to be tried, at such place as they shall deem most suitable and convenient for the purpose; and shall make full report of their doings to Congress at their next session.

Sec. 3. And be it further enacted, that to carry into effect the foregoing objects, there be, and hereby is, appropriated, out of any money in the Treasury not otherwise appropriated, the sum of six thousand dollars; and so much thereof as shall be necessary for the above purposes shall be subject to the order of the said board, and to defray such expenses as shall be incurred by their direction, including the sum of three hundred dollars to each, for his personal service and expenses: provided, however, and their accounts shall be settled at the Treasury, in the same manner as those of other public agents.

Approved, June 28th, 1838. M. VAN BUREN.

The New York papers inform us that the bill for preserving the lives of passengers in steam-boats, has passed both Houses of Congress. It declares an explosion or other disaster to be *prima facie* evidence of negligence, and sufficient for conviction.

TRIALS OF ANTHRACITE COAL FOR LOCOMOTIVE ENGINES.

We understand that on Friday the 3rd ult., a trial of the applicability of anthracite coal, as a fuel for locomotive engines, was made on the Liverpool and Manchester Railway, under the superintendence of Mr. Woods, the engineer of that line, and with the approbation of the board of directors. Mr. E. O. Manby, an engineer connected with the South Wales anthracite district, who has devoted his attention most successfully to the introduction of this fuel, was present, and assisted in the trial.

The engine employed was the Vulcan, one of the smaller engines, used for conveying goods. The general result of the experiment was highly satisfactory. In the first instance, the engine ran out without a load about six miles; and the coal was found to do very good duty, without any difficulty being experienced, either with the tubes or in getting up the fires. It was noticed that the fuel burnt nearly without dust from the chimney, and entirely without smoke. The engine brought back a load of coal waggons from the Huyton colliery, and acquired a speed, thus loaded, of 21 miles an hour, which is about the duty of the Vulcan.

Another trial was made in the evening, with the same engine, for the whole distance to Manchester, taking five loaded waggons. The journey was performed in one hour and 29 minutes. The consumption of anthracite was only 5½ cwt., although a large portion was wasted from the fire bars being too wide apart for the economical use of this fuel. The engine would have used upwards of 7½ cwt. of coke for the same journey, and for the same load. We regard the success of this trial as likely to prove, in its result, a most important public benefit. The price of coke, as the demand for it for use in locomotive engines on railways has extended, has increased in some places almost 50 per cent.; and in districts which produce no coal, this enhanced cost of coke will be seriously prejudicial to the success of railway undertakings. If anthracite can be generally applied in locomotive engines, we are given to understand that a saving of 30 or 40 per cent., in cost and quality, will be effected.

The application of anthracite to marine engines, is the next object most deserving the attention of practical men. The journalists of the United States appear to claim for their country almost the exclusive production of this invaluable fuel, which is destined to play so great a part in the iron manufacture, in railway locomotion, and in steam navigation; but the Western part of the South Wales coal field, with reference to which Liverpool is, geographically, so favourably situated, contains stores of anthracite of much superior quality to those specimens of American which we have seen, and can produce it at a much smaller cost.—*Liverpool Albion.*

[We have been favoured with a few particulars of three trials of anthracite coal on the London and Birmingham line, which have been made during the past month. Their result has been the reverse of satisfactory. The coal it seems, flies to pieces from the heat, and thus falls into a close layer on the fire bars, greatly obstructing the draught. Coke on the contrary, from its light and open texture, and the large irregularly shaped masses in which it comes from the oven, allows of a free draught, though it generally lies on the bars to the thickness of twelve inches. The result was, that in each of the three trials, the engine came to a stand at the same spot, which was a steep inclination, when other fuel had to be used. But it appears that the anthracite does very well in conjunction with coke, though not alone. We are informed that the coal used in these experiments was similar to that tried on the Liverpool and Manchester line, though from a different mine. And it is said that the coal used by Mr. Manby had been previously coked; but to what extent does not appear.—Ed. C. E. and A. Journal.]

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

REPORT OF PAPERS READ AND PROCEEDINGS, SESSION 1838.

(*Continued from page 292.*)

On Huddart's Rope Machinery. By George Drysdale Dempsey.

The above communication on the improvements in rope manufacture, introduced by the late Captain Huddart, contains a general account of the successive improvements introduced, and a description of the machinery invented by that celebrated man and erected at Limehouse.

It is accompanied by ten sheets of drawings of the machinery.

The preceding communication having been laid before the meeting, a discussion took place on the relative strength of the cables of Huddart's and the ordinary manufacture. The strength of two-inch rope of Huddart's, when compared with that of the ordinary manufacture, is as 8 to 5¼. The increase in strength was greater for large ropes than for small. The best test of the wear of ropes, are those of mines. A five-inch Huddart's rope has been found to last twice as long as a six-inch rope; the weight of the former is much less, consequently there is a great saving in power as well as in durability. It was stated that there was danger of the tar being of such a temperature as to char the yarns; tar of the temperature of boiling water was the best.

On Huddart's Rope Machinery. By E. Birch.

In this communication, the author has described the general mode of manufacture, prior to the improvements introduced by Captain Huddart, and the establishment of the works at Limehouse.

It is accompanied by fifteen sheets of drawings of the machinery.

On the relative Heating Powers of Coke and Coal in Melting Glass. By Apsley Pellatt, Assoc. Inst. C.E.

The object of this paper is to confirm some statements of Mr. Parkes,* as to the calorific power of coke and coal, from experience of the author's in melting glass. The great loss of heat arising from the flame and unconsumed gaseous portions of the fuel being driven up the flues, when the furnaces are heated by coal, and the fact that coke succeeds better than coal in annealing glass, determined the author to persevere for a month in heating the furnaces with coke, and to compare the result with those obtained when the best coal was employed.

The construction of the furnace, and the arrangement of the pots and flues are described. The furnace is somewhat reverberatory, being between an air furnace and an oven; the smoke and flame not escaping at the top, but being drawn to flues betwixt the pots, which are set round in a circle. For the purpose of obtaining sufficient heat about the points and sides of the pots, there are small holes, called "bye-holes," through which the flames should play outward in a length of 5 or 8 inches. The healthful action of the furnace is indicated by the length of the flame issuing from the bye-holes and tops of the flues. Great care is requisite in regulating the supply of air, too much air endangering the pots, too little checking the heat of the furnace. The bars were obliged to be placed at 2 inches apart instead of 1½; the greater concentrated heat of the coke not only requiring more air, but having a tendency to melt the bars; lumps of fire-brick also were thrown in, to supply the deficiency of clinkers. To make, however, the flues and bye-holes draw well, it was necessary to use ⅕th of screened coals with ⅘ths of good coke by measure. The following is the result:—For nine months, the consumption of coals for a 7 pot furnace was 18 tons per week. For four months, on the new system, the consumption was 10½ tons of coke, and 5 tons of screened coals per week. Deducting then these 5 tons, it appears that 10½ tons of coke are of the same value as 13 tons of coal, or there is a saving of near 20 per cent. in the weight of fuel, and a superiority of 25 per cent. in the heating power of coke above that of coal. Considerable advantage is also derived from the saving of the pots, and in other incidents peculiar to the manufacture of glass.

Mr. Parkes observed that the preceding statements had more than confirmed his results. From the statements of Mr. Pambour, on whose data his calculations had been founded, it appeared that gas coke was inferior to Worsley coke by 12½ per cent.; in his reasonings he had allowed 20 per cent. as the difference betwixt good coke and coal; but according to the results given by Mr. Pellatt, the allowance ought to be 32½ per cent. He was of opinion that the advantage to be ascribed to the screenings was partly chemical and partly mechanical. The coal would fill up the interstices of the coke, and prevent the air from escaping unconsumed.

Mr. Pellat remarked, that the safety of the pots was a very important consideration. By the terms hard and soft coke, he understood foundry and gas coke; the former gave a much more intense heat, and lasted longer. The coke he had used was gas coke, and about 14 cwt. to the chaldron. Mr. Fox stated that the coke in use on the London and Birmingham Railway, is about the same weight. It was stated, that coal which lost ⅓th in weight gained ⅓th in bulk by coking.

* See Minutes, p. 170, Journal No. VII.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

[The following minutes of Proceedings were inadvertently omitted in the last number of the Journal.—Ed.]

At an Ordinary General Meeting of the Members, held on Monday, the 25th of June, 1838.

P. F. Robinson, Esq., V.P., in the Chair.

The Secretary communicated that the Council had requested his Lordship the President, to apply for her Majesty's permission to allow Mr. Behnes a sitting for the purpose of taking a bust of the Queen, to be deposited in the Institute as Patroness; and his Lordship's letter on the subject to the Marquess of Lansdowne, was read, together with an answer communicating her Majesty's gracious consent to the request.

A letter was read from Sir Alexander Grant, acknowledging with thanks the invitation of the Institute, and presenting to the Library a copy of Durand's Parallèle des Edifices anciens et modernes.

The following donations were also received: Dr. Granville; Copy of his work on the Spas of Germany; Guide to St. Petersburgh, 2 vols. 8vo.; and plans and elevations of Hospitals and Scientific Institutions in Paris, 31 plates.—S. Whitwell, Esq.; Copy of his pamphlet on Warming and Ventilating.—P. Hardwick, V.P.; Reports of the Surveyor General of H.M. Land Revenue, 2 vols. folio; Reports of Commissioners of Public Records, 2 vols. folio.—J. Foulston, Fellow; Model of Scaffold for erecting the Devonport Memorial; and various specimens of granites and slates.—W. R. Billings, Associate; Copy of his work on the Temple Church.—Monsieur Suys, Corresponding Member; Plan du Palais de Justice, Bruxelles.—G. B. Webb, Associate; Specimen of Asphaltic pitch from the banks of the Euphrates.

Dr. Granville explained the nature of the series of views presented by him.

Mr. Foulston described the nature of the specimens, and the construction of the model presented by him.

Mr. Griffiths proceeded with his lectures on Chemistry as applied to construction;—subject, Marbles, Lime-stone, Mortars, Cements.

At an Ordinary General Meeting of the Members, held on Monday, the 9th of July, 1838.

P. F. Robinson, Esq., V.P., in the Chair.

The following gentlemen were elected:—As Fellow, Archibald Simpson, Architect, of Aberdeen;—as Associates, George Vulliamy, Architect, of Pall-mall; H. G. Atkinson, Architect, of Upper Gloster-place, R.P.

The following donations were received:—Society of Arts; Copy of their Transactions, Part II. of vol. 51.—Heddon Stone Company; three specimens of their stone.—Lieut. C. T. Hill, R.N., and W. S. Inman, Fellow; Plan of Paris.—T. L. Donaldson, Hon. Sec.; Bill of the Westminster Improvement Company.—G. Godwin, jun., Associate; No. 19, of his work on the Churches of London; and Nos. 1 and 2 of a series of papers on Construction, commenced in London's Architectural Magazine.

A summary of the first three numbers of the Ephemeris of the Archæological Society of Athens, was read, translated from the original by Lieut.-Col. Leake.

Mr. Crace exhibited a fac-simile of the Plate Armour of the Duc de Guise. It was made in France, of a material called Carton Pierre,—a composition which presents a beautifully sharp and even surface. It is then prepared and finished by a particular process, which renders it a perfect imitation of iron or steel. Mr. Crace likewise stated that he has embossed suits of richer description, and also shields, arms, &c. And further, that having discovered the process before mentioned, it is his intention to manufacture these objects in England.

Mr. Griffiths read the fourth paper of his series;—subject, Paints, Varnishes, &c.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS, AND THE ARCHITECTURAL SOCIETY.

FACTS CONNECTED WITH THE ATTEMPT RECENTLY MADE TO EFFECT THE JUNCTION OF THE TWO SOCIETIES.

Some of the principal members of these two societies, have long felt how desirable it would be, to concentrate the exertions made by the two bodies for the promotion of the art. Sir John Soane, when he made his munificent donation to these societies, expressed a strong wish that he might have been able to unite in one, the gift which he presented to them severally; and his wish has been responded to by several of the leading members both of the Royal Institute of British Architects, and of the Architectural Society.

A special general meeting of the latter, was held on the 3d of July, at which the following resolution was passed:—

"That a junction of the two Architectural Societies would, if formed upon principles of mutual concession, be highly advantageous to the profession; and that a committee of five members be forthwith appointed, to confer with a similar number of gentlemen on the part of the Royal Institute of British Architects, and to report the result of such conference to the Society at large, on or before the 1st of August following."

In pursuance of the above resolution, the following members were the same evening appointed—Mr. W. B. Clarke, President; Mr. Barnes, Mr. Wyatt, Mr. Moore, Mr. Crake, Mr. Ferrey.

This having been communicated to the Council of the Royal Institute of British Architects, Messrs. Barry, Hardwick, and Robinson, Vice Presidents, and Messrs. Kendall, Taylor, and Donaldson, were appointed to confer with the Committee of the Architectural Society.

These gentlemen accordingly had two meetings, and mutually agreed to the following scheme for the union of the two Societies:—

1. The Members of the Architectural Society, who have been in practice seven years, to join the Royal Institute of British Architects as Fellows.

2. Those who have been in practice five years, to enter in a new class, to be expressly constituted, under the title of "Associated Fellows," and to pay annually three guineas.

3. The Associated Fellows to have all the privileges of Fellows, except voting and eligibility to offices.

4. The Members elected into the class of "Associated Fellows," become by *right*, and without ballot, Fellows, upon announcing their intention to join such class, at the expiration of their having been in practice seven years; and to pay two guineas, to make their contribution on admission five guineas, equal to that paid by the Fellows of the Royal Institute of British Architects.

5. The class of Associated Fellows to cease at the end of two years.

6. Those under five years, to join as Associates, and to pay annually two guineas.

7. A permanent class to be created, called the "Students' Class," at a subscription of one guinea per annum, to receive the students of the Architectural Society.

8. Their privilege, to attend all Ordinary Meetings and Lectures.

9. The members of the Architectural Society to be elected without ballot in their respective classes, as conforming to paragraph 21 of Section IV. of the Bye-laws of this Institute, upon the introduction of the Council.

10. The several members so joining, to sign the Declaration of the Royal Institute of British Architects.

11. The President and one other Member (or any two) of the Architectural Society, to be recommended by the Council of the Royal Institute of British Architects for election forthwith, as members of the Council.

12. The members of the Architectural Society, who join the Royal Institute of British Architects, to make over to the Royal Institute of British Architects all their shares in the funded property, books, casts, prints, drawings, furniture, and other effects of the Architectural Society, and the same to fall into and become an integral part of the property of the Corporation.

The Council of the Royal Institute of British Architects recommended to the adoption of the members, the several propositions contained in the preceding scheme; feeling confident that, should their hopes have been realized, of an union of the two bodies, not only would the Institute have been benefitted by such an accession, but the purposes for which both Societies were originally established, might have been more efficiently carried into effect. The adoption of these propositions involved the suspension, for a short period, of some of the Bye-laws of the Institute; but the Council considered that, as such suspension would not have been operative upon any regulation connected with the character and respectability of practice in the members, the temporary departure from the established regulation would have been amply compensated by the great good, which would have been effected by the concentration in one Body of the exertions of all the members of the Profession.

This scheme was confirmed by a special general meeting of the Fellows of the Institute, on the 31st of July; and on the 1st of August, the Architectural Society decided at a special meeting, that it would not be desirable that a junction of the two Architectural Societies should be formed upon the terms contained in the scheme. On the same evening, Messrs. Walker, Ferrey, Moore, Wright, Bury, Lee, Parish, Woodthorpe, Brandon, and Flower, ceased to be members; Messrs Johnson and Watson have since withdrawn: and we understand that several others have expressed their intention to resign. The unforeseen decision of the Architectural Society arose, it would appear, from the absence of several supporters of the scheme abroad or in the country, the badness of the weather in the evening, and the general confident anticipation that the equity of the propositions would have disarmed opposition. The result, however, will be different from that expected by the opponents of the measure, who mustered in strong numbers; the Architectural Society thus deprived of its chief members, we fear may be considered as so much crippled in its usefulness, as to be virtually dissolved.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This learned body having fixed upon Newcastle-on-Tyne as the place of their eighth meeting, the various members began to assemble on Thursday and Friday the 16th and 17th ult.; and on Saturday, the meeting of the General Committee was held. The newspaper reports speak in high terms of the excellence of the arrangements made; and give most encouraging accounts of the prosperity of the Association.

The business of the Sections commenced on Monday the 20th. It is our intention to give our readers such information as comes within our province, respecting the proceedings. We regret however that the press of matter which has filled our columns, renders it impossible in the present number to do more than record the subjects of the proceedings of Section G, that of Mechanical Science.

Monday, August 20th. On a new Day and Night Telegraph, by Joseph Garnett. On Isometrical Drawing, by Thomas Sopwith. Description of an improved method of constructing large Secretaires and Writing-tables, by Thomas Sopwith. On the power of economising and regulating Heat for Domestic purposes, by George Webb Hall. Notices on the Resistance of Water, by John Scott Russell. On the principles of Oblique Bridges, by Peter Nicholson. Remarks on the material and mechanical construction of

Steam Boilers, by W. Greener. And a communication from Mr. Maule, on a substitute for the Forcing-pump in supplying Steam Boilers.

Tuesday, August 21st. A new Rotatory Steam-engine, by S. Rowley. Report on Railway Constants, by Dr. Lardner.

In the evening of the same day, an interesting meeting was held at the Model room of the Association. Professor Babbage, the president of the Section of Mechanical Science, illustrated by reference to models and diagrams the arts of Engraving on copper and wood: exhibiting also specimens of the art of printing in colours from wood blocks, communicated by Mr. Knight the publisher. The Rev. Dr. Robinson of Armagh explained the construction of the wooden Viaduct over the Ouseburn, as exhibited in a model. Professor Willis exhibited and explained a model of a new Locomotive Engine.

Wednesday, August 22nd. On the improved Construction of Railways, by Mr. J. R. Peele. The construction of Railway upper works, by Mr. Mosley. A new mode of pumping Leaky Vessels, by Dr. Dalziell. On a new dry Gas Meter, by Mr. Saunders. On a Machine for raising water, or a Hydraulic Belt, by Mr. Hall. On a new Steam-engine Boiler, by Mr. Price. On the construction of Geological Models, and on an improved Levelling Stave, by Mr. Sopwith.

Thursday, August 23rd. Professor Phillips described an Odontograph, or instrument for setting out the teeth of wheels, illustrated by a model. Mr. Lang exhibited models of a round headed Rudder for Ships, and a Tube Scuttle. Dr. Lardner spoke at considerable length on Steam Navigation; and described the principle of his self recording Steam Journal, of which he also exhibited a model. Mr. Russel made some observations on the present state of Steam Navigation. The Section then adjourned to Saturday morning.

LAW PROCEEDINGS.

[The important case, Ranger *v.* the Great Western Railway Company, is necessarily deferred to a future number.]

ROLLS COURT, CHANCERY LANE, *July 4th.*

THE ATTORNEY GENERAL, ON THE RELATION OF JEREMIAH HAMMOND *v.* GREAT WESTERN RAILWAY COMPANY.

Mr. Kindersley applied to the court for an injunction to restrain the defendant from making a bridge, along which the Great Western Railway was to pass, over a certain aqueduct or canal, which had been constructed under an act of Parliament passed in the 43rd year of the reign of his late Majesty George the Third, for the purpose of increasing the navigation to the Bristol docks, as well as for a feeder to the dock in which the vessels float.

Mr. Pemberton observed that the object of the canal was twofold—the one to increase the trade, and the other to cleanse the docks; the present application was against constructing the bridge in a particular way. The members of the dock company were interested in the canal as well as this undertaking, and he thought they were necessary parties. He also thought that it would be necessary for the defendants to answer the affidavits, which, though they had been made some time, had not been filed till the 27th of June.

The motion was then allowed to stand over.

July 19th.

Mr. Kindersley proceeded in this motion, on the part of the relators. It appeared from his statement that the proposed bridge crossed the cut at a very oblique angle; and that the cut was at that point 64 feet wide. The Railway Company proposed to construct a bridge of three arches, 16, 27, and 16 feet wide respectively, the middle one forming the water-way, and the towing path passing through one of the side arches. The Canal Company insisted on having their towing path preserved alongside the cut, without the intervention of the pier; and demanded for this purpose an arch 31 feet wide, 24 for water-way, and 7 for towing path. The Railway Company refused to accede to the demand, except on condition of the Canal Company bearing the additional cost of their own plan.

Mr. Pemberton, on behalf of the Railway Company, stated that there were 28 bridges between Oxford and Datchet, all of which, except those on the suspension principle, had the towing path separated from the water-way.

Mr. Kindersley replied, that if Mr. Brunel had not stopped at Datchet, but come down to the bridges at Staines, Walton, Kingston, and Richmond, he would have found none of the towing paths separated from the river.

Lord Langdale said he could not concur in the inference, that because old bridges were built in an inconvenient manner, the present parties had a right to do the same. His Lordship ultimately ordered the case to stand over; and an experiment to be made meanwhile, whether the existing coffer-dam did impede the navigation, as it was alleged that the pier would when the bridge was completed; and whether it was feasible without a towing-rope to get the barge through the water-way.

July 27th.

Mr. Kindersley stated that the experiment ordered had been made, and was proceeding with some remarks upon it, when he was interrupted by

Mr. Pemberton, who offered, on the part of the Railway Company, to construct an arch sufficiently large to allow of an eight foot towing path, without contracting the water-way. Or they would even make under the arch a road-way for horses, supported on iron piles; but this would narrow the water-way at least six feet.

The motion was ordered to stand over for a week, to allow time for an arrangement between the parties.

August 6th.

Mr. Kindersley, with whom was Mr. Richards, stated that the Railway Company had offered to make a towing path five feet wide under the arch over the water-way of the feeder to the Bristol Floating Dock, which was to be protected from the water by a rail of two feet nine inches high. The proposal, however, was not considered sufficient; and the plaintiffs required that it should be made one foot wider, with a rail of three feet. This he considered necessary, as horses in drawing always pulled diagonally, and where more than one horse was used, the one nearest the boat was frequently almost pulled into the water.

Mr. Pemberton (with whom was Mr. Osborne) complained that the plaintiff did not meet the proposal of the defendants, but always asked for something beyond the utmost of the offer. There was now a gangway on the outside of the coffer dam, which apparently answered all the purposes for which the plaintiffs were contending.

Mr. Colville appeared for the dock company, who refused to interfere.

Mr. Kindersley replied.

Lord Langdale observed that, assuming he had jurisdiction under the acts, it was necessary for the court to consider whether it would make any order. The defendants, it appeared, were under some mistake, as it was the duty of those who undertook such extensive speculations to apply the whole of their knowledge and experience so as not to occasion any public inconvenience. He thought, however, that a towing path was requisite, but he was without any information which could inform him what was sufficient. He certainly ought to be satisfied that the proposal made, afforded a safe path; and if that could be done, he was not disposed to make any order which could embarrass the works of the defendants.

His Lordship subsequently, after some further discussion between the parties, refused to make any order, upon the defendants undertaking to make such a towing-path as an umpire, to be appointed, should consider proper.

The plaintiffs, however, objected to a railway engineer being appointed the umpire.

RAILWAY COMPENSATIONS.

In the Sheriff's Court, on Wednesday July 18, Mr. Jones, landlord of the Wheatsheaf public-house in Anthony-street, St. George's-in-the-East, sought to recover compensation from the Blackwall Railway Company, for his premises, which are required by the company, and for the goodwill of his business. The claim was 2,500*l.*, the award of the jury 1,700*l.* In the course of the trial, it was stated, that publicans have a profit of 45s. per butt, upon porter, 35 per cent. on spirits, and nearly cent. per cent. on the minor articles of their trade.

In the Sheriff's Court, on Saturday the 11th ult., a Special Jury was called to decide to what amount of compensation the claimants Messrs. Baker were entitled, for certain premises and lands required by the Blackwall Railway Company for the prosecution of their works.

Mr. Ellis and Mr. Bromley, valuers, proved that the claim set up was not an exorbitant one. The facts of the case appeared to be briefly these:—That Messrs. Baker possessed a freehold, used as a timber yard, with several houses adjoining, in Rosemary-lane; and that Mrs. Maddock held a lease of the premises, at a rental of 50*l.*, thirteen years and a half of the term of which were unexpired. The premises were let at an improved rent of 150*l.* a year, and the valuer for the claimants calculated the fair compensation to which Mrs. Maddock was entitled, at nine years and three-quarters' purchase; which, by the 5 per cent. tables, would amount to 1,528*l.* 16s. From further calculations made in reference to the freeholder's claim, the sum demanded was 3,500*l.*

On behalf of the company, Mr. Tite the surveyor stated that the present market price was certainly not more than 3,000 guineas for both the freeholder's and leaseholder's interests in the property.

Mr. Higgins, surveyor to the Commissioners of Woods and Forests, was likewise examined, and fixed the value of the premises at 3,820*l.*

The jury, after about half an hour's consideration, awarded the claimants the sum of 4,475*l.*

RATING OF RAILWAYS.

At the quarterly sessions for the county of Chester, held at Knutsford on Tuesday, July 17th, an appeal by the Grand Junction Railway Company, against the assessment for the relief of the poor of the township of Hartford, came on for trial. It was admitted by the counsel on both sides that the distance of railway passing through the township of Hartford was one mile and 470 yards; that the amount of tonnage received by the Railway Company for the whole length of the line between Warrington and Birmingham was 1,236*l.* 0s. 6d. per mile, which, for the Hartford distance, was 1,521*l.* 13s. 6d. Mr. Cottingham, in stating the respondents' case, said that the only point in dispute between the parties, was the amount of deductions to be made on account of the expenses incurred by the Company in maintaining the railway in a working and tenantable condition. After counsel had been heard, and witnesses examined, the magistrates retired for a short time, and on again entering the court, the chairman said they were of opinion that the rate ought to be amended. They would allow 300*l.* per mile for the expenses of repairs, engineering, gate-keepers, police, and fences; 30*l.* 18s. per mile, or 2½ per cent. for the collection of the tonnage; 274*l.* 4s. per mile, being 20 per cent. as tenants' profit. The rate was therefore amended, pursuant to this decision, viz. reducing the rateable value per mile from 1,500*l.* to 607*l.*

PARLIAMENTARY PROCEEDINGS.

House of Commons.—List of Petitions for Private Bills, and progress therein.

Those marked thus — are either withdrawn or rejected.

	Petition presented	Bill read first time.	Bill read second time.	Bill read third time.	Royal Assent.
Aberbrothwick Harbour	Feb. 12.	—	—	—	—
Anti Dry-rot Company	Dec. 7.	Feb. 26.	—	—	—
Ardrossan Railway	Feb. 16.	—	—	—	—
Belfast Waterworks	Dec. 21.	Apr. 6.	—	—	—
Birmingham Equitable Gas	Feb. 16.	Mar. 2.	—	—	—
Birmingham, Bristol, and Thames Junction Railway	Feb. 16.	Mar. 26.	May 15.	—	—
Birmingham and Derby Junction Railway	May 11.	May 25.	June 6.	June 27.	July 27.
Blackburn Gas	Feb. 14.	Mar. 8.	Mar. 22.	May 10.	July 4.
Bolton and Preston Railway	Feb. 15.	Mar. 14.	April 30.	May 28.	July 4.
Boughrood (Wye) Bridge	Feb. 14.	Mar. 26.	April 27.	May 21.	June 11.
Brandling Junction Railway	Jan. 16.	Feb. 14.	Mar. 20.	Apr. 25.	June 11.
Bristol and Exeter Railway	Feb. 12.	Mar. 21.	Apr. 3.	May 9.	June 11.
Bury (Lancaster) Waterworks	Feb. 18.	Mar. 15.	Mar. 30.	May 21	June 11.
Bude Harbour	Mar. 30.	—	—	—	—
Cheltenham and Great Western Union Railway	Dec. 15.	Feb. 20.	Feb. 27.	Mar. 28	June 11.
Cookham Bridge	Feb. 15.	Mar. 8.	Mar. 20.	Apr. 25.	May 9.
Deal Pier	Feb. 16.	Mar. 26.	April 26	May 18.	June 11.
Eastern Counties Railway	Jan. 25.	Feb. 26.	June 1.	June 27.	July 27.
Edinburgh and Glasgow Railway	Jan 25.	Mar. 2.	Mar. 13.	May 7.	July 4.
Exeter Commercial Gas	Feb. 16.	Mar. 26.	April 27.	May 21.	July 4.
Farringdon (London) Street	Feb. 5.	Mar. 26.	May 8.	June 15.	July 27.
Fen Drayton (Cambridge) Enclosure	Feb. 14.	April 25.	May 8.	May 31.	July 4.
Fishguard Harbour	2nd bill.	June 30.	July 7.	July 19.	July 27.
Fleetwood Tontine	Feb. 15.	Mar. 26.	—	—	—
Garnkirk and Glasgow Railway	Feb. 13.	Mar. 26.	Apr. 25.	June 21.	July 4.
Glasgow Waterworks	Feb. 2.	Feb. 26.	Mar. 16.	June 11.	July 27.
Grand Junction Railway	Feb. 12.	Mar. 8.	Mar. 29.	June 8.	July 4.
Gravesend Cemetery	Feb. 14.	Mar. 21.	Apr. 3.	April 30.	June 11.
Gravesend (No. 1) Pier	Jan. 25.	Feb. 7.	Feb. 26.	—	—
Gravesend (No. 2) Pier	Feb. 16.	Mar 26.	—	—	—
Great Central Irish Railway	Feb. 26.	Apr. 3.	—	—	—
Hartlepool Dock and Railway	Feb. 16.	Mar. 26.	May 3.	July 11.	—
Herne Gas	Feb. 16.	Mar. 26.	—	—	—
Isle of Thanet Cemetery	Feb. 14.	Mar. 26.	May 31	June 20.	—
Lady Kirk and Norham (Tweed). Bridge	Feb. 16.	Mar. 26.	May 3.	June 11.	July 4.
Leamington Priors Gas	Feb. 16.	Mar. 26.	April 26.	June 11.	July 1.
Leicester Gas	Feb. 16.	Mar. 26.	April 30.	May 31.	July 1.
London and Croydon (No. 1) Railway	Dec. 22.	Feb. 23.	Mar. 7.	April 4.	June 11
London and Croydon (No. 2) Railway	Dec. 22.	—	—	—	—
London and Greenwich Railway	Dec. 11.	Feb. 7.	Feb. 20.	Mar. 21	Apr. 11.
London Grand Junction Railway	Feb. 15.	Mar. 26.	April 26.	—	—
Londonderry Bridge	Nov. 27.	Mar. 5.	April 30.	May 18.	June 11.
Manchester, Bolton, and Bury Canal, &c.	Jan. 23.	Feb. 19.	Mar. 8.	May 3.	June 11
Metropolitan Suspension Bridge	Feb. 16.	Mar. 26.	May 8.	June 15.	July 4.
Midland Counties (Mountsorrel) Railway	Feb. 8.	Mar. 16.	Mar. 29.	May 23.	July 1.
Montgomeryshire Western Branch Canal	Jan. 16.	Feb. 27.	—	—	—
Moy River (Ireland) Navigation	Feb. 13.	—	—	—	—
Necropolis Cemetery	Dec. 14.	Feb. 12	Feb. 26.	—	—
Newcastle-upon-Tyne Railway	Dec. 4.	Feb. 9.	Mar. 6.	May 3.	June 11.
Newcastle-upon-Tyne and North Shields Railway	Feb. 14.	—	—	—	—
Newquay (Cornwall) Harbour	Feb. 13.	Mar. 26.	May 3.	May 28.	July 27.
Newtyle and Cupar Angus Railway	Feb. 13.	Mar 26.	April 25.	June 21.	July 4.
Oldham Gas and Waterworks	Feb. 13.	Mar. 8.	April 2.	July 1.	July 31.
Oxford and Great Western Union Railway	Feb. 16.	Mar. 7.	Mar. 11.	June 8.	— •
Paington Harbour	Dec. 7.	Dec. 22.	Jan. 16	Feb. 28.	Mar. 30
Portland Cemetery	Feb. 16.	—	—	—	—
Portsmouth Floating Bridge	Feb. 15.	Mar. 8.	Mar. 26.	April 27.	May 9.
Rocester Bridge	Feb. 14.	Mar. 19.	April 3.	May 28.	July 4.
Royal Exchange	May 25.	June 11.	June 21.	July 16.	—
St. Helen's and Runcorn Gap Railway	Feb. 15.	Mar. 16.	Mar. 30.	April 27.	June 11.
St. Philip (Bristol) Bridge	Feb. 16.	Mar. 26.	May 10.	May 31.	July 4.
Saltash Floating Bridge	Dec. 21.	—	—	—	—
Soane's Museum	Feb. 12.	—	—	—	—
Southampton Docks	Feb. 14.	Mar. 29.	May 7.	June 1.	July 4.
Southampton Pier	Feb. 9.	Mar. 26.	May 4.	June 6.	July 4.
Taw Vale (Devon) Railway and Dock	Feb. 15.	Mar. 12.	Mar. 26.	May 3.	June 11.
Tenby Improvement and Harbour	Jan. 23.	Feb. 9.	Feb. 26.	Apr. 3.	May 9.
Thames Improvement Company and Drainage Manure Association	Dec. 4.	Feb. 16.	—	—	—
Thames Purifying Company	Feb. 16.	—	—	—	—
Turton and Entwisle Reservoir	Feb. 13.	Mar. 8.	Mar. 21.	May 8.	June 11.
Tyne Dock	Feb. 16.	—	—	—	—
West Durham Railway	Feb. 16.	—	—	—	—
West India Docks	Feb. 18.	Mar. 28.	Apr. 9.	April 30.	May 9.
Westminster Improvement	May 15.	June 26.	—	—	—

STEAM NAVIGATION.

***First Departure of a Steam Vessel for St. Petersburg.*—On Wednesday forenoon, the 2nd ult., the St. George's Steam Navigation Company's vessel Sirius, recently trading between London and New York, commanded by Captain Moriarty, sailed from East-lane-stairs, Bermondsey, for St. Petersburg. This is the first steam-ship which has left the Thames for the Russian capital. She had a considerable number of passengers, principally merchants, on board.**

Bristol, July 16.—A meeting of the Great Western Steam-ship Company was held this day by adjournment (at the Commercial Rooms) for the purpose of confirming or otherwise, the resolutions passed at the last meeting, which went to the creation of new shares and the extension of the capital of the company to 1,000,000*l*. The chairman explained, that in consequence of the objections of a portion of the proprietors, to the admission of new shareholders until the year 1839, the directors had determined to abide by the deed of settlement, and only at present to fill up the capital to the amount stated in the deed. The debtor and creditor accounts of the company were then read; from which it appeared that the prospects of the company were so excellent, that after setting down the expenses of the first voyage to the cost of the ship, the actual profit on the two others has been sufficient to admit of a very handsome dividend, which would be declared according to the deed of settlement on the 6th of September. It was also stated that 97 berths for her next voyage were already taken; and that the keel of another steamer, to be called the City of New York, would be laid down in the course of a few days, all the preparations being already in progress.—*Times.*

The Steam Ship Tiger.—High as were the anticipations of the capabilities of this noble vessel, she has, in practice, more than realized them. On Tuesday morning, July 31st, she dropped anchor in Hull roads on her return from Hamburg. The passage out she made in the unprecedentedly short period of thirty-five hours and a half; that home occupied forty-nine hours, three of which were spent at anchor; but the circumstances under which it was performed render it, perhaps, even more remarkable than the run out, the weather being so bad that the French steamer kept her port, and the first class steam-ships from London to Hull, even the Wilberforce, exceeded their average passage by ten hours. The Tiger is a genuine Hull-built ship, and it is confidently predicted, by those who ought to be good judges, that she will prove the fastest cargo steam-ship registered in the United Kingdom Her burden is 800 tons; her engines are of 300 horse power (having Samuel Hall's patent condensers, by which pure distilled water, instead of salt water, is supplied to the boilers); and her equipment, in every respect, does the highest credit to the port of Hull and to the owners—the St. George Steam-packet Company.—*Hull Paper.*

Incrustation of Boilers.—The following method employed by Captain Kennedy, commanding her Britannic Majesty's steamer Spitfire, to prevent the incrustations or deposits of saline matter on the inside of the boilers of steam-engines, has been communicated by him in a letter to M. Gautier, of the French consulate at Malta. Captain Kennedy recommends, after having well cleaned the boilers and tubes, to coat those parts of their interior surface most exposed to the action of the fire, with a mixture composed in the proportion of 18 pounds of melted suet and 3 pounds of powdered black lead. He states that the advantages of this application have been so fully tested by experience, that the Lords of the Admiralty have resolved (?) that all the Government steamers shall for the future be provided with a sufficient quantity of the above-mentioned ingredients.—*French paper.*

Steam-Vessel Boilers.—We understand that an *important experiment* was lately tried on the river, by the direction of C. W. Williams, Esq., with a very successful result. It is no less than a machine which effects the purpose of cleaning out the boilers of steam vessels without stopping the working of them. The apparatus is said to be the joint invention of Messrs Maudslay and Field, of London, and Mr. Scott, of Sunderland, and has hitherto been only partially (although successfully) used in the Great Western. The apparatus is exceedingly simple, as may be judged from the fact, that it was attached to the boilers of the Duchess of Kent, Dublin steamer, in ten hours.—*Liverpool Albion.*

New Fuel for Steam Navigation.—We understand that Mr. Williams, the chief director of the Dublin Steam Company, has discovered a new description of fuel applicable to the uses of steam navigation, and particularly for vessels intended for a long voyage, as it considerably diminishes the weight to be carried. It is stated that experiment has proved one ton of the new fuel to be equal in effect to four tons of the best coal. Mr. Williams has already secured the benefit of this important discovery by a patent, and the public are likely soon to be put in possession of the nature of this new kind of fuel. A discovery of this kind was alone wanted to remove the last remaining obstacle to transatlantic steam navigation—namely, the enormous dead weight of coal required for engines of great power by large vessels on long voyages. This new fuel, a specimen of which we have seen, we hear is manufactured from a description of peat or turf found in Ireland, called stone turf, from its weight and solidity, and which produces a most intense heat. This stone peat, when mixed with tar, and subjected to a very high pressure, has all the appearance of the best cannel coal.—*Liverpool Paper.*

PROGRESS OF RAILWAYS.

GREAT WESTERN RAILWAY.

Extracts from the Report of the Engineer to the Board of Directors.

Gentlemen, As the endeavour to obtain the opinions and reports of Mr. Walker, Mr. Stephenson, and Mr. Wood, prior to the next half yearly meeting, has not been successful, I am anxious to record more fully than I have previously done, and to combine them in one report, my own views and opinions upon the success of the several plans which have been adopted at my recommendation in the formation and in the working of our line; and in justice to myself and to these plans, and indeed to enable others to arrive at any just conclusion as to the result which has been attained, or as to the probable ultimate success or advantages of the system, it is necessary that I should enter very fully, I fear even tediously, into a recapitulation of the circumstances peculiar to this railway which led to the consideration and adoption of these plans; which some call innovations and wide deviations from the results of past experience, but the majority of which, I will undertake to show, are merely adaptations of those plans to our particular circumstances. * *

The circumstance of the Great Western Railway and other principal railways likely to extend beyond it, having no connexion with other lines then made, leaving us free from any prescribed dimension, *the seven feet gauge* was ultimately determined upon. Many objections were certainly urged against it, the deviation from

the established 4 feet 8 inches was then considered as the abandonment of a principle; this however was a mere assertion, unsupported even by plausible argument, and was gradually disused; but objections were still urged, that the original cost of construction of all the works connected with the formation of the line must be greatly increased.

That the carriages must be so much stronger that they would be proportionably heavier, that they would not run round the curves, and would be more liable to run off the rails, and particularly that the increased length of the axles would render them liable to be broken;—these objections were not advanced as difficulties, which existing in all railways might be somewhat increased by the increase of gauge, but as peculiar to this and fatal to the system.

With regard to the first objection, namely, the increased cost in the original construction of the line; if there be any, it is a question of calculation, which is easily estimated, and was so estimated before the increased gauge was determined upon. Here, however, preconceived opinions have been allowed weight in lieu of arguments and calculations, cause and effect are mixed up without much consideration.

It was assumed at once that an increased gauge necessarily involved increased width of way and dimensions of bridges, tunnels, &c.

Yet such is not the case within the limits we are now treating of: a 7 feet rail requires no wider bridge or tunnel than a 5 feet, the breadth is governed by a maximum width allowed for a loaded waggon, or the largest load to be carried on the railway, and the clear space to be allowed on either side beyond this.

On the Manchester and Liverpool Railway, this total breadth is only 9 feet 10 inches, and the bridges and viaducts need only have been twice this, or 19 feet 8 inches—9 feet 10 inches was found, however, rather too small; and in the London and Birmingham with the same width of way, this was increased to 11 feet by widening the interval between the two railways.

In the space of 11 feet allowed for each rail, a 7 feet gauge might be placed just as well as a 5 feet, leaving the bridges, tunnels, and viaducts exactly the same; but 11 feet was thought by some still too narrow, and when it is remembered that this barely allows a width of 10 feet for loads, whether of cotton, wool, agricultural produce, or other light goods, and which are liable also to be displaced in travelling,—13 feet, which has been fixed upon in the Great Western Railway, and which limits the maximum breadth under any circumstances to about 12 feet, will not be found excessive.

It is this, and not the increased gauge, which makes the minimum width actually required under bridges and tunnels, 26 feet instead of 22 feet.

The earthwork is slightly affected by the gauge, but only to the extent of 2 feet on the embankment, and not quite so much in the cuttings; but what in the practice, has been the result?

The bridges over the railway, on the London and Birmingham, are 30 feet, and the width of viaducts 28 feet. On the Great Western Railway, they are both 30 feet, no great additional expense is therefore incurred on these items, and certainly a very small one compared to the increased space gained, which as I have stated is from 10 to 12 feet. In the tunnels exists the greatest difference—On the London and Birmingham Railway, which I refer to as being the best and most analagous case to that of the Great Western Railway, the tunnels are 24 feet wide. On the other Great Western Railway, the constant width of 30 feet is maintained, more with a view of diminishing the objections to tunnels, and maintaining the same minimum space which hereafter may form a limit to the size and form of every thing carried on the railway, than from such a width being absolutely necessary.

Without pretending to find fault with the dimensions fixed, which have no doubt being well considered upon the works on other lines—I may state that the principle which has governed me, has been to fix the minimum width, and to make all the works the same, considering it unnecessary to have a greater width between the parapet walls of a viaduct which admits of being altered, than between the sides of a tunnel, which cannot be altered.

The embankments of the London and Birmingham Railway are 26 feet—on the Great Western, 30 feet; making an excess of about 6½ per cent. on the actual quantity of earthwork.

The difference in the quantity of land required, is under half an acre to a mile On the whole, the increased dimensions from 10 feet to 12 will not cause any average increased expense in the construction of the works, and purchase of land, of above 7 per cent—8 per cent having originally been assumed in my report in 1835, as the excess to be provided for.

With respect to the weight of the carriages, although we have wheels of 4 feet diameter, instead of three feet, which, of course, involves an increased weight, quite independent of the increase of width; and although the space allowed for each passenger is a trifle more, and the height of the body greater, yet the gross weight per passenger is somewhat less.

	Tons.	cwt.	qrs.
A Birmingham first class coach weighs - - -	3	17	2
Which with 18 passengers, at 15 to the ton - -	1	4	0
Or 631 lbs. per passenger -	5	1	2
A Great Western first class weighs - - -	4	14	0
And with 24 passengers - - - -	1	12	0
Or 588 lbs. per passenger - - -	6	6	0
And our 6-wheeled first class - - -	6	11	0
With 32 passengers - - - -	2	2	2
Or 600 lbs. per passenger - - -	8	13	2

Being an average of 594 lbs. on the two carriages.

This saving of weight does arise from the increased width, and is notwithstanding the increased strength of the framing and the increased diameter and weight of the wheels; I have not weighed our second class open carriages, but I should think the same proportion would exist.

As to the breaking of axles or running off the line, what has been the result? That from some causes or other, we have been almost perfectly free from those very objections which have been felt so seriously on some other lines. Far from breaking any engine axles, not even a single cranked axle has been strained, although the engines have been subjected to rather severe trials. One of our largest having a short time back been sent along the line at night when it was not expected, came into collision with some ballast waggons, and was thrown off the line nearly six feet; none of the axles were bent or even strained in the least, although the front of the carriage, a piece of oak of very large scantling, was shattered. After ten weeks running, one solitary instance has occurred of a carriage in a train getting off the line and dragging another with it; and this was not discovered till after running a mile and a half. As the carriage was in the middle of the train, and one end of the axle was thrown completely out of the axle guard, there must have been some extraordinary cause, possibly a plank thrown across the rail way by a blow from the carriage which preceded, and which might have produced the same effect on any railway; and at any rate, it was a strong trial to the axle, which was not broken, but merely restored to its place, and the carriage sent on to London. The same mode of reasoning which has by some been used in favour of the 4 feet 8 inch gauge, if applied here, would prove that long axles are stronger than short, and wide rails best adapted for curves. All that I think proved, however, is this—that the increased tendency of the axles to break, or of the wheels to run off the rails, is so slight, that it is more than counterbalanced by the increased steadiness from the width of the base, and the absence of those violent strains which arise from irregularity in the gauge, and the harshness of the ordinary construction of rails. In fact, not one of the objections originally urged against the practical working of the wide gauge has been found to exist, while the object sought for is attained, namely—the capability of increasing, at any future period, the diameter of the wheels, which cannot be done, however desirable it may hereafter be found, with the old width of rail. This may be said to be only prospective; but in the mean time contingent advantages are sensibly felt in the increased lateral steadiness of the carriages and engines, and the greater space which is afforded for the works of the locomotives; and here I wish particularly to call your attention to the fact, that this prospective advantage, this absence of a most inconvenient limit to the reduction of the friction which, with our gradients, forms 4-5ths, or 80 per cent. of the total resistance, was the object sought for, and that, at the time of recommending it, I expressly stated as follows:—"I am not by any means prepared at present to recommend any particular size of wheel, or even any great increase of the present dimensions. I believe they *will* be materially increased, but my great object would be in every possible way to render each part *capable* of improvement, and to remove what appears an obstacle to any great progress in such a very important point, as the diameter of the wheels, upon which the resistance which governs the cost of transport, and the speed that may be obtained, so materially depends."

These advantages were considered important by you,—they are now considered so by many others; and certainly every thing which has occurred in the practical working of the line, confirms me in my conviction, that we have secured a most valuable power to the Great Western Railway, and that it would be folly to abandon it.

The next point I shall consider is *the construction of the engines*, the modifications in which, necessary to adapt them to higher speeds than usual, have, like the increased width of gauge, been condemned as innovations.

I shall not attempt to argue with those who consider any increase of speed unnecessary. The public will always prefer that conveyance which is most perfect, and speed within reasonable limits is the material ingredient in travelling.

A rate of 35 to 40 miles an hour is not unfrequently attained at present on other railways in descending planes, or with light loads on a level, and is found practically to be attended with no inconvenience.

To maintain such a speed with regularity on a level line, with moderate loads, is, therefore, quite practicable, and unquestionably desirable. With this view the engines were constructed; but nothing new was required or recommended by me—a certain velocity of the piston is considered the most advantageous.

The engines intended for slow speeds have always had the driving wheels small in proportion to the length of stroke of the piston. The faster engines have had a different proportion—the wheels have been larger, or the strokes of the piston shorter. From the somewhat clamorous objections raised against the large wheels, and the construction of the Great Western Railway engines, and the opinions rather freely expressed of my judgment in directing this construction, it would naturally be supposed that some established principle had been departed from, and that I had recommended this departure.

The facts are, that a certain velocity of piston being found most advantageous, I fixed this velocity, so that the engines should be adapted to run 35 miles an hour, and capable of running 40. As the Manchester and Liverpool Railway engines are best calculated for 20 to 25, but capable of running easily up to 30 and 35 miles per hour; and fixing also the load which the engine was to be capable of drawing, I left the form of construction and the proportions entirely to the manufacturers, stipulating merely that they should submit detailed drawings to me for my approval. This was the substance of my circular, which, with your sanction, was sent to several of the most experienced manufacturers. Most of these manufacturers, of their own accord, and without previous communication with me, adopted the large wheels as a necessary consequence of the speed required. The recommendation coming from such quarters, there can be no necessity for defending my opinion in its favour—neither have I now the slightest doubt of its correctness. As it has been supposed that the manufacturers may have been compelled or induced by me to adopt certain modes of construction, or certain dimensions in other parts by a specification—a practice which has been adopted on some lines—and that these restrictions may have embarrassed them, I should wish to take this opportunity to state distinctly, that such is not the case. I have indeed, strongly recommended to their consideration the advantages of having very large and well formed steam passages, which generally they have adopted, and with good results; and with this single exception, if it can be considered one, they have been left unfettered by me (perhaps too much so), and uninfluenced, except indeed by the prejudices and fears of those by whom they have been surrounded, which have by no means diminished the difficulties I had to contend with.

The principal proportions of these engines being those which have been recommended by the most able experimentalists and writers, and these having been adopted by the most experienced makers, it is difficult to understand who can constitute themselves objectors, or what can be their objection.

Even if these engines had not been found effective, at least it must be admitted that the best and most liberal means had been adopted to procure them; but I am far from asking such an admission. The engines, I think, have proved to be well adapted to the particular task for which they were calculated, namely—high speeds; but circumstances prevent their being beneficially applied to this purpose at present, and they are therefore working under great disadvantages. An engine constructed

expressly for a high velocity, cannot of course be well adapted to exert great power at a low speed, neither can it be well adapted for stopping frequently and regaining its speed. But such was not the intention when these engines were made, neither will it be the case when the arrangements on the line are complete; in the mean time, our average rate of travelling is much greater than it was either on the Grand Junction or the Birmingham Railway, within the same period of the opening. I have but one serious objection to make to our present engines, and for this, strange as it may seem, I feel that we are mainly indebted to those who have been most loud in their complaints. I refer to the unnecessary weight of the engines; there is nothing in the wide gauge which involves any considerably increased weight in the engines. An engine of the same power and capacity for speed, whether for a four feet eight inch rail, or for a seven feet rail, will have identically the same boiler, the same fire-box, the same cylinder, and piston, and other working gear, the same side-frames, and the same wheels; the axles, and the cross-framing will alone differ, and upon these alone need there be any increase; but if these were doubled in weight, the difference upon the whole engine would be immaterial; but the repeated assertions, and frequently professing to come from experienced authorities, repeated until it was supposed to be proved, that the increased gauge must require increased strength and great power, was not without its indirect effect upon the manufacturer. Unnecessary dimensions have been given to many parts, and the weight thereby increased, rather tending as I believe to diminish than to add to the strength of the whole. I thought then, and I believe now, that it would have been unwise in this case to have resisted the general opinion, and taken upon myself the responsibility which belonged to the manufacturers, but I need not now hesitate to say, that a very considerable reduction may be effected, and that no such unusual precautions are necessary to meet these anticipated strains—resistance, such being in fact imaginary. It cannot surprise anybody that under such circumstances, attention was more occupied in endeavouring to meet these imaginary prejudiced objections, than in boldly taking advantage of the new circumstances, and that a piece of machinery constructed under such disadvantages, was not likely to be a fair sample of what might be done. I am happy to say, however, that the result of the trials that have been made, has entirely destroyed all credit in these alarmists with the manufacturers; and that we may hope in future to have the benefit of the free exercise of the intelligence and practical knowledge of engine manufacturers.

The mode of laying the rails is the next point which I shall consider. It may appear strange that I should again, in this case, disclaim having attempted anything perfectly new; yet regard to truth compels me to do so. I have recommended in the case of the Great Western the principle of a continuous bearing of timber under the rail, instead of isolated supports, an old system recently revived, and as such I described it in my report of January, 1836; the result of many hundred miles laid in this manner in America, and of some detached portions of railway in England, were sufficient to prove that the system was attended with many advantages, but since we first adopted it, these proofs have been multiplied; there need now be no apprehension. There are railways in full work, upon which those who are willing to be convinced, that a permanent way in continuous bearings of wood may be constructed, in which the motion will be much smoother, the noise less, and consequently—for they are effects produced by the same cause—the wear and tear of the machinery much less, such a plan is certainly best adapted for high speeds, and this is the system recommended by me and adopted on our road. There are, no doubt, different modes of construction, and that which I have adopted as an improvement upon others, may, on the contrary, be attended with disadvantages. For the system I will strenuously contend, but I should be sorry to enter with any such determined feeling, into a discussion of the merits of the particular mode of construction. I would refer to my last report, for the reasons which influenced me, and the objects I had in view in introducing the piling; that part which had been made under my own eye answered fully all my expectations. Here the piles did answer their purpose, and no inconvenience resulted from their use. The difficulties which we have since encountered; the bad state in which the line was for a considerable time, and which has only recently improved, has undoubtedly been aggravated if not caused by these piles; but not as I believe from a defect in the principle as applied in our case when the line is mostly in cutting or on the surface, but from defective execution; for notwithstanding the determination to allow sufficient time for this most important operation, yet to make up for previous delays and loss of time, it became necessary at last to force forward the work more rapidly than was at all consistent with due care in the execution; and, during the whole of this period, I was most unfortunately prevented by a serious accident from even seeing the work almost until the day of opening, whereas I ought to have personally superintended the whole. I do not mean that the work was neglected by those whose duty it was to supply my place—far from it; but, in such a case, a new work cannot be properly directed except under the eye of the master. Following exactly the plan which had succeeded on the first piece completed, several serious faults were committed; a much greater density and firmness of packing is required than was previously supposed—the mode of packing adopted and the material selected in the first instance, have proved defective elsewhere, and over a great extent of the line, particularly in the clay cuttings, and where the work was at last most hurried, it has been badly executed. But many parts have stood well from the commencement—others are fast improving; and I have the satisfaction, although a very painful one, of seeing, that if, in the first instance, a foundation of coarse gravel had been everywhere well rammed in before the timbers had been laid, and the packing formed upon this, we should from the onset have obtained as solid a road as we have now over a great part of the line. What we have been able to effect since the opening of the line, has necessarily been a slow, expensive, and laborious operation. We have been compelled to open the ground and excavate it to a depth of 18 inches under the longitudinal timbers, and this without interrupting the traffic. To remove the whole of the material thus obtained from off the line, and to replace it by coarse ballast; and not having the means of sufficiently consolidating this ballast by ramming while the timber is in its place, the packing has to be repeated once or twice after it has been compressed by the passing of the trains. This new packing, however, does stand; and, in a few weeks, I expect that the line will be in a very different state from that in which it has been, or indeed now is, from what I have described as the result which can now be, and might have been, obtained. From the commencement, it will be inferred that I am disposed still to defend the system of piling. I certainly could not abandon it from conviction of its inefficiency, for I see proofs of the contrary; and I feel that, under similar circumstances, I could now prevent the mischief that has occurred. Upon that portion of the line where the permanent way must next be formed, piling could not be resorted to, the ground being a solid hard chalk for many miles. I had intended, however, recommending the same principle, but in a different form, holding down the longitudinals by small iron rods driven into the chalk; but the same objection could not exist, because the chalk cannot yield under the timbers like clay or even gravel. But I should wish most anxiously to avoid anything like obstinate adherence to a plan, if the object I believe essential can be obtained by any other means; particularly when that plan, being my own, I may be somewhat prejudiced in its favour. I find that the system of piling involves considerable expenses in the first construction, and requires, perhaps, too great a perfection in the whole work; and that if the whole or a part of this cost were expended in increased scantling of timber and weight of metal, that a very solid continuous rail would be formed; for this as a principle, as for the width of gauge, I am prepared to contend; and to stand or fall by it, believing it to be a most essential improvement where high speeds are to be obtained. I strongly urge upon you not to hesitate upon these two main points, which, combined with what may be termed the natural advantages of the line, will eventually secure to you a superiority which, under other circumstances, cannot be attained.

As regards *the expense of forming the permanent way* on this principle, I am quite prepared to maintain what I have on a former occasion advanced, that even on the system which we have adopted between London and Maidenhead, the total cost does not materially exceed that of a well constructed line with stone blocks. I did not make in the outset an exact estimate of the total cost of either mode. I was unable to obtain the cost which has actually been incurred on other lines; but a comparative estimate was made, and the result of that comparison led me to state that the one might exceed the other by 500*l.* a mile. The actual cost of our permanent way appears by the detailed account, which has been made out, to have been above 9000*l.*, including expenses of under-draining and forming the surface, which cannot be included in the cost, given in other cases, because that drainage, although, I believe, generally forming part of the plan, is not yet constructed; this sum includes the sidings at the stations, switches, points, and other contingencies, and also the expenses incurred during the first month of working the line, and which, as I have before stated, consisted in removing and replacing work which had been improperly executed. These items will make a considerable reduction; and besides these, larger reductions may be effected in parts of the work which were new, and from the circumstances naturally attending a first attempt were not so economically conducted as they might be, or indeed, as they were towards the close of the works, when the different parts were let by contract. Taking the prices at which the work was latterly actually executed, 8,000*l.* per mile would be a liberal allowance for our future proceedings even adopting the same system; and with a modified system such as that suggested, of simple longitudinal bearers of large scantling and rail of 54lbs. per yard, at the present high price of iron, the cost calculated upon our actual past expenditure would not exceed 7400*l.* per mile. This I am aware is a larger sum than that which has usually been assumed as the cost of the permanent way. I cannot prove that others have cost more, or even so much as this, as I have nothing but the published accounts to refer to; but this I can state and prove if necessary, that rails and blocks such as are now being adopted on the Manchester and Liverpool Railway, would upon our line cost at least as much.

The prime cost of rails and chairs delivered on the line, would alone amount to half the money; and nothing is perhaps more certain, than that the experience of other lines within the last two or three years, has proved that this part of the construction of a railway is unavoidably much more expensive than was ever calculated for, at the time our estimates were made.

I am, Gentlemen,

Your obedient servant,

I. K. BRUNEL.

THE BIRMINGHAM BRISTOL AND THAMES JUNCTION RAILWAY.

The Directors are happy to report, that the differences which existed at the last general half yearly meeting as to whether the Railway should pass over or under the Paddington Canal, have been removed.

In order finally to settle this question, which impeded the execution of the works at a point where completion was necessary before further works could properly proceed, the Board determined to submit the question with every information they possessed bearing on the subject, to the decision of Mr. Vignoles, an engineer wholly unconnected with either of the great lines of Railway with which the Thames Junction Railway is intended to communicate, and whose eminence in his profession and skill were universally admitted.

Mr. Vignoles having been accordingly consulted, reported to the Board his opinion, that the line of railway laid down to pass under the Paddington Canal was the preferable method to be adopted by this Company, having reference to the circumstance that the Thames Junction Railway was projected to communicate with the London and Birmingham and Great Western Railways, and also with the Paddington Canal.

In consequence of this opinion, which was also in accordance with that of Mr. Cubitt, the eminent engineer, who had originally been consulted, the Directors immediately instructed Mr. Cubitt, the contractor, to proceed with the important work of the proposed gallery under the Paddington Canal, and the Directors are happy to report that it is in so advanced a state that by the 11th of next month it will be completed. The Paddington Canal will then be diverted; for which purpose the necessary excavation has, for some time past, been finished, and the engineer will then be enabled to obtain soil from his excavations between the Gallery and the Birmingham Railway, to proceed with the embankment across Eynham Farm towards the Uxbridge road.

That embankment has now reached Eynham Farm, and will be completed from the soil to the north of the Paddington Canal. The work of forming the line from the London and Birmingham Railway to a field adjoining the Uxbridge road, has been let to responsible contractors upon terms satisfactory to the Board.

The Directors are also happy to state that the differences which existed between them and the Great Western Railway Company, have been removed; and that an improved mode of intercommunication of the two railways, recommended by Mr. Vignoles and Mr. Hosking, has been arranged between the engineers of the two companies.—*Extracted from Directors' Report.*

The London and Southampton Railway is expected to be opened as far as Hook in the course of this month.

We understand an application is about to be made to Parliament for the construction of a branch railway from Newbury, to form a junction with that of the Great Western.

London and Birmingham Railway.—On Monday the 20th ult., a large party of Directors and Proprietors breakfasted at the Birmingham station; and at half-past six, they left, with one of Mr. Bury's engines, to make the first excursion along the entire line to London, where they arrived at the Euston station at one o'clock, without any kind of accident, or circumstance to interfere with the pleasure of the journey. The time occupied in travelling was exactly five hours, the other hour and a half being devoted to the examination of the stupendous and interesting works on the new part of the line, much of which is yet incomplete. The distance to Coventry, 18¼ miles, has performed in 36 minutes; from Coventry to Rugby, 11 miles, in 22 minutes; from Rugby to Denbigh Hall, 35 miles, in 2 hours and 10 minutes; and from Denbigh Hall to London, 48 miles, in 1 hour and 54 minutes: in all 5 hours and 2 minutes. The Kilsby Tunnel has been constructed in defiance of immense physical difficulties, and is a work which has excited the greatest interest and admiration. When the party arrived at the central shaft, which has a diameter of sixty feet, they were saluted with hearty cheers from a number of workmen who had stationed themselves at its summit far above the subterranean travellers, who responded to the welcome. The rocky excavation at Blisworth, extending through a considerable extent of country, astonished the visitors perhaps as much as any other part of the line; and must be seen, to enable any person to form an adequate idea of its character. The Wolverton viaduct, excited great admiration; and many of the proprietors walked down the embankment to enjoy a view of the beautiful structure from the meadows below. At the great Wolverton station, or central depôt for the engines, the workshops and arrangements were inspected, and refreshments were liberally provided. The remainder of the journey, although entitled to notice, presented fewer features of novelty. The jaunt gave much satisfaction.—*Midland Counties Herald.*

Northern and Eastern Railway.—The whole of the land between Waltham Cross and Broxbourne is now in possession of the Company, with the exception of a small piece belonging to the Ordnance Office, and the works are in rapid progress. At Broxbourne, the bridge over the mill-dam has been commenced,—the plans for the station-house have been approved,—and the notices as far as Roydon are now being served. South of Waltham Cross, the lands belonging to Mr. Dyson and to Bethlehem Hospital, are also in the possession of the Company; and, as soon as the Edmonton Jury cases are at an end, the communication between Waltham Cross and the two miles of the line which are already finished at Tottenham, will be complete. We still think that the first eleven miles may be opened on the 1st of June, 1839, and that the line between Broxbourne and Harlow will also be ready for public use by the 1st of June in the following year.—*Herts Reformer.*

Gloucester and Birmingham Railway.—The works are proceeding with great vigour along the entire line, those in our immediate vicinity advancing as rapidly as on any other portion of the line. The new road from Westhall-green to the depôt near the Gloucester-road is completely formed, and the excavations for the depôt itself have been carried on to a very great extent. The preparations for the bridge across the Gloucester road have also been commenced in earnest.—*Cheltenham Looker-on.*

Midland Counties Railway.—The neighbourhood of Spondon, near Derby, has presented a busy scene for the last week. A diversion of the canal had to be made by the Railway Company, which could not be effected without stopping the navigation, for which there was a penalty of 2*l per hour.* The contractor (Mr. Mackenzie) taking advantage of a stoppage of the canal, mustered his forces from the other parts of the contract; and has succeeded in executing the diversion while the repairs of the canal were going on, to the astonishment of the natives. Between 200 and 300 men were employed in a very small space, and when all busily at work, presented a very animated spectacle. To induce the men to persevere and work an extra number of hours, Mr. Mackenzie supplied them daily with a substantial dinner of beef and ale (in addition to their wages), which was served out and eaten on the works.—*Railway Times.*

Midland Counties Railway.—The works on this line are in a great state of forwardness between Nottingham and Derby. Several miles of road are ready for laying the permanent way: *and one-half of the whole length will be laid by the end of the present year,* unless the weather should prove unfavourable. The public may expect the *above named portion of the line to be opened on the 1st of May, 1839.* The line between Nottingham and Derby, it is anticipated, will be better than any yet made, as the rails are stronger in section than any now in use; the blocks are of a very superior quality, and the materials for ballast of the best description for the purpose. A beautiful cast iron bridge is to be built over the river Trent, at Red Hill; it will consist of three arches, each of 100 feet span. The contractor is now constructing the coffer dam for the pier; he has also commenced the tunnel through the ridge near Red Hill. From the Trent to Leicester, the contractors are proceeding with the greatest possible despatch. Nearly 4,000 men are employed, viz.:—800 on the Nottingham and Derby line, about 1,200 between the Trent and Leicester, and nearly 2,000 between Leicester and Rugby. The line across the meadows approaching the Nottingham station, is proceeding with railway celerity, and the contractors feel confident that this part of the line will be finished long before the stipulated time.—*Derbyshire Courier.*

North Midland Railway.—It is calculated that the double line of permanent rails, for the North Midland Railway, will weigh about 180 tons per mile.—*Sheffield Mercury.*

Sheffield and Manchester Railway.—The survey of this railway is, we are glad to learn, proceeding rapidly. From the entrance into Manchester to Durnford Bridge, the exact line has been determined; and for nearly the whole of the distance, the breadth of land required has been nicked out upon the ground, and negotiations opened for its purchase. We understand that Mr. Vignoles will proceed shortly with the staking out on the Yorkshire side.—*Sheffield Mercury.*

New Junction Railway.—Amongst the railways now in course of execution in the manufacturing districts, the Manchester and Leeds is perhaps the most important. From the directors of this railway, the Liverpool and Manchester board have lately received a proposition to consider the desirableness of a connecting railway, of something less than two miles in length, to unite two main lines in the immediate vicinity of Manchester; thus forming a continuous line of railway from Liverpool to Leeds, or by means of the Selby Railway, to Hull. The subject of this proposition is one of great importance, and accordingly will receive the best consideration of the directors.—*Leeds Intelligencer.*

Branch Railway to Stalybridge.—We understand it is the intention of the gentlemen of Ashton and Stalybridge to apply for an act of parliament to connect those townships with a branch railway from the Sheffield line. The land is already staked. When executed it will be a great convenience to the inhabitants.

North Union Railway.—The most strenuous and active efforts are in progress for the completion of this line. The contractors are making every possible exertion to effect an opening into the town as early as possible in the next month. The works of the Ribble Bridge have of late proceeded very satisfactorily, and with extraordinary expedition.

Preston and Wyre Railway.—Owing to an unparalleled season of cold and wet weather during the present summer, this work has not progressed as much as was anticipated; yet much has been done on the line in the cuttings, &c. by the contractor, who has taken the advantage of keeping the men employed both day and night when the weather permitted, the sets working 8 hours at a time. A portion of the line between Poulton and Burn Naze has been permanently laid; and in the course of a fortnight it is expected that there will be a locomotive engine at work, which will be the means of forwarding the same with greater rapidity. The wall or embankment at Wyre, between Burn Naze and Fleetwood, is going steadily on under the able superintendence of Mr. D. Cowling, C.E. About 16 barges are employed daily in bringing gravel from Knot End to Burn Naze, for the purpose of ballasting the permanent road.—*Preston Pilot.*

Great North of England Railway.—On Wednesday, July 18, the first stone of the bridge over the river Ouse at Poppleton, near York, was laid by C. H. Elsley, Esq., Recorder of York, one of the directors of the Company. We are informed, that it is contracted to be completed in August, 1839, and we understand that the whole line from York to Darlington will be opened before the commencement of the year 1840. The bridge will be built with stone from the quarries at Knaresborough, according to the design furnished by Messrs. J. and B. Green, of Newcastle upon-Tyne: it will consist of three semi-elliptical arches of 66 feet span each, rising 19 feet above the springing. The total length will be nearly 300 feet, by 29 feet wide, and it will be about 30 feet high above the summer water level. The corner stone laid on this occasion weighed about four tons. The works near Northallerton, which were in a state of great forwardness and partly finished on the South side of the Castle Hill, were unfortunately stopped on Wednesday evening, by the sudden fall of a massive bridge, nearly finished, over the Willow Beck. By this accident three men have been severely injured; it happened however providentially, that most of the workmen had left a few minutes previous to its fall, or the consequences might have been fatal to several of them.—*Tyne Mercury.*

Edinburgh and Glasgow Railway.—The Directors of this spirited undertaking are about to commence immediate operations, and the first section of the work, of nearly five miles in length, in the parish of Ratho and neighbourhood, will be begun whenever the contracts are concluded—probably in October next. We consider this undertaking as a great national improvement, which must lead to the most benefical effects to the inhabitants of Edinburgh, Glasgow, and the public at large.—*Edinburgh Observer.*

Glasgow and Ayr Railway.—The contractors for executing the section of the railway lying nearest Ayr are proceeding with great vigour. A number of men have for some time been employed in cutting a pass through an elevation about half way between Prestonwick toll and the sea. The material excavated being pure sand, is easily handled, and admits of great celerity of motion on the part of the labourers.

Government have notified that they will not advance one shilling to the projected Irish Railway speculations.—*Limerick Chronicle.*

Powerful Railway Engine.—On Monday the 20th ult., the largest locomotive engine ever made in Leeds was tried on the Leeds and Selby Railway, by the makers, Fenton, Murray, and Jackson, previous to its being sent to the Paris and Versailles Railway, in France. With only one carriage and the tender, this engine travelled at the rate of 60 miles an hour; and at the rate of 20 miles with 110 tons, both on the level part of the line. In consequence of some improvement in the fire-box, this engine seems to do its work with ease; as, during the trials, it produced more steam than was required, and with the fire-door kept open. By good judges, we believe this locomotive engine is considered to be of the first-rate workmanship and finish, and to do great credit to the makers.—*Leeds Mercury.*

An Ingenious American Proposal for illuminating Railways.—A writer in the *National Intelligencer* (an American paper) states, that Mr. Herron, a distinguished civil engineer on the Gasten and Raleigh Railway, proposes to illuminate railways during night travel by a light shed in front of the locomotive, so strong and brilliant as to illuminate objects to a considerable distance ahead. The description of the mode in which he proposes to accomplish his purpose, is as follows:—"The chimney of the locomotive now in general use is placed foremost on the road. This end of the boiler is covered by a large sheet iron box, rounded at top, and surmounted by the chimney. The flame from the furnace passes through the boiler into this box, by means of from sixty to one hundred and forty tubes, each nearly two inches in diameter, so that the end of the boiler, which also forms the inner end of the box, presents an appearance much resembling a honeycomb: and from each cell, when the engine is in motion, a bright jet of flame issues and curves upwards towards the chimney, so that the whole interior of the box is filled with one intense sheet of flame. The waste steam from the cylinders is conducted by a pipe through the box to the inferior orifice of the chimney, up which it is discharged with great force, in the form of a jet, which drives the air in the chimney before it, and draws that contained in the box after it, thus forming a vacuum, which is immediately filled by the flame from the furnace. In the external end of the box, immediately under the chimney, is a sheet iron door, of rather an elliptic form, and of sufficient size to admit a man with ease to make any necessary repairs on the tubes, &c. Suppose we remove this sheet-iron door, and cover the orifice closely with a large semi-circular lantern, glazed with small panes of glass or talc; it would seem to be a reasonable inference that a very brilliant light must be emitted, exceeding that of any lighthouse. It would be proper to place a fine wire netting over the orifice first, to keep sparks out of the lantern: and if glass is used, it should be slightly oiled, to keep it from cracking by heat. Perhaps a very fine wire gauze, similar to that employed by Sir Humphrey Davy in his celebrated safety lamp, might alone, without the lantern, prove more efficient, as it would admit a small quantity of atmospheric air, thus rendering the combustion more perfect, and increasing the brilliancy of the flame. The whole end of the box might be thus formed, and it would be less liable to injury or accident than the lantern. It will be perceived that the experiment can be made on most of the locomotives now used, without any alteration whatever of their parts, and at a trifling expense: and this expense will be quickly repaid by dispensing with the oil consumed in the lamps so uselessly at present."

NEW CHURCHES.

New Church at Morningside.—On Sunday, July 29th, the new church recently erected in the village of Morningside, was opened for the first time, for public worship, by the Rev. Dr. Chalmers. The site and the building are both very much admired. The plans were furnished by our townsman, Mr. Henderson, architect, London-street; whose professional talents and correct taste have been eminently displayed in the numerous churches recently erected under his superintendence, and which have given universal satisfaction.—*Edinburgh Advertiser.*

The New Synagogue in Great St. Helen's.—This edifice has just been completed, under the superintendence of Mr. Davies, and is unquestionably one of the most elegant and finished buildings in the metropolis. The ceiling is reckoned unrivalled in its kind: it is adorned with flowers, which are at the same time large and most finely wrought, and which serve to conceal apertures, by the means of which the whole building is ventilated. The pillars are of the Corinthian order, those that are along the gallery being white, and those by the altar in imitation of yellow marble. The steps to this altar are of real marble, and most massive in appearance. The small rails in front of the ladies' gallery, and the mouldings about the altar, are richly gilded, yet with such taste and delicacy that magnificence never degenerates into gaudiness. The arabesque paintings of the windows are splendid, and still the some good taste has kept them within the bounds of delicacy and neatness. The woodwork, namely, the seats and reading-desk, is of a good substantial character, and of a wainscot colour. Those parts of the building which are not immediately connected with divine service, such as the committee-room, the readers' apartment, &c., are most complete in their way; and though, of course, less striking, reflect the greatest credit on the designer of the whole.—*Times.*

PUBLIC BUILDINGS AND IMPROVEMENTS.

Birmingham Railway Terminus.—Two extensive buildings are in progress at the Euston Square terminus, immediately opposite to the grand entrance; the one to be appropriated for an hotel, and the other for dormitories, with a spacious coffee room on the ground floor. Philip Hardwicke Esq is the architect, and Messrs. Grissell and Peto are the contractors.

London University College.—On the 1st ult. a number of workmen commenced rebuilding that portion of the premises which was destroyed accidentally by fire two years ago. The work is expected to be completed in three months.

Manchester.—Three statues are in contemplation in th's town; a colossal one of the Duke of Bridgewater, which Lord F. Egerton has generously offered to the town at his own expense; one of Dr Dalton, whose scientific attainments do honour to his native place, and which is to be done by public subscription; and the third, to the late James Watt.

Green Market, Newcastle-on-Tyne.—This capacious place forms part of a covered market, the most extensive in Europe, the parallelogram of buildings occupying a space of 13,906 yards. The vegetable market, or Green-market, as it is called, is 338 feet long and 57 feet wide. Its lofty roof of open timber framing, which is gracefully thrown into a frame combining strength with elegance, is supported by metal pillars; and when viewed in perspective from either end, presents the grandeur of a cathedral, rather than the mere carpentry of a market-place. Two handsome stone fountains are placed in the midst of the market, in a line with two of the cross; and at each end are two recesses, in one of which is a clock, whilst the other contains the arms of Newcastle.—*Times.*

Newcastle-on-Tyne.—The colossal statue of Earl Grey, by E. H. Bailey, R.A., intended to be placed on the pillar now nearly finished at the top of Grey street, arrived here on Monday the 20th ult, and was removed by two waggons from the Quay to the site of the monument. It is expected to be raised in a few days. The height of the pillar from the ground is 121 feet, and the statue, including the plinth, is 14 feet; when placed in its proper position, the mean height will be 135 feet.—*Tyne Mercury.*

Monument to Sir Walter Scott in Selkirkshire.—It gives us much pleasure to learn, that the gentry and inhabitants generally of the county of Selkirk—that county with which Sir Walter was so intimately connected through the greater portion of his life—have determined on erecting a testimonial of their respect and admiration for his memory; and that the town council of Selkirk have, in the most handsome manner, unanimously granted a site at the Market Cross. A statue and pedestal, to be enclosed with a railing, has been agreed upon by the managing committee; and Mr. Alexander Ritchie, of Musselburgh, one of our most distinguished sculptors, has been engaged to execute the work, according to one of two designs which have been agreed on; the one to cost three hundred, and the other five hundred pounds. As the latter comprehends a pedestal highly ornamented with figures in *alto relievo*, we hope that the subscriptions, which are rapidly filling in, will be found adequate for its adoption. The Duke of Buccleuch, with his usual liberality and patriotic spirit, has come forward to head the subscription, with a sum of fifty guineas.—*Edinburgh Observer.*

FOREIGN INTELLIGENCE.

French Steam Carriage.—The *Nouvelliste* states that a steam carriage is to start from the Carrière de l'Etoile, on Sunday next, to proceed to Brussels, the engineer expecting to do the distance, 60 leagues, in 12 hours.—*Times, Aug.* 18.

The site of the Archiepiscopal Palace on the South and East of Notre-Dame is to be converted into a public promenade, and the approaches to the cathedral improved. A contract for the masonry and iron work has been granted by the municipality of Paris; and the total expense is estimated at more than 100,000 francs.

Brussels, August 2.—This morning a trial was made on the iron railway, of a perpetual motion, which is intended to supersede steam in drawing the trains. This unknown and mysterious power, which has excited the solicitude of our greatest capitalists, was such that it forced the waggons off the rails after they had run about three yards. The secret did not transpire.

Railways in Belgium.—The railway from Brussels to Ostend is advancing with admirable rapidity, and that from Ghent to Lille proceeds with equal speed. We are assured that the latter will be positively completed in November, 1839.—*Morning Herald.*

The Bruges and Ghent Railway was opened at the former city last month, with great ceremony, in the presence of the King and Queen of the Belgians, the civil and military authorities, and the commercial guilds of the city.

It seems that the destruction of the church at Hoorn, arose from the carelessness of the plumbers who were at work in the gutters. This church was one of the largest and handsomest in the kingdom; it was dedicated to St. John the Baptist and St. Cyprian. It was in the form of a cross; 300 feet long, 120 feet broad, and 67 feet high. The steeple was 170 feet high, had remarkable heavy bells, and a fine carillon; the organ, which was very fine, was built in the years 1744-1777. The expenses of rebuilding the church will be enormous, but it will be ardently desired by all patriotic citizens; the damage is estimated at about 400,000 florins; nothing was insured.—*Dutch Paper.*

New Machine for Spinning Flax.—We learn from Hamburgh that a gentleman of that town, named Grimm, has invented a machine for spinning flax, which will produce in one day as much thread as 300 spinners could produce in the same time with spinning wheels. An Englishman is said to have offered him 60,000 marcs (about 4,000*l.*) for the machine, which he has refused, wishing to speculate himself upon his invention.

Railway from Venice to Milan.—By letters from Italy, it appears that the directors of this great undertaking, for which a capital of 50 millions Austrian lires (about 1,700,000*l.* sterling) in 50,000 shares, is subscribed, are in daily expectation of receiving from the Emperor of Austria its still required conclusive privileges. Already the plans of the line and the calculations of the levels and inclines are completed. This railway will pass through the most densely populated and the most interesting parts of the Lombardo-Venetian kingdom, connecting the splendid capitals, Milan and Venice, by the ancient towns of Brescia, Verona, Vicenza, and Padua, besides numerous smaller intermediate places. The length of the whole line from Venice to Milan will be 271,361 metres, or about 146½ Italian or English miles. It will cross many rivers, many canals and high roads. It will cross the post roads 11 times—four times on the same level, six times almost on the same level, and in one instance only, at an elevation of three metres. None of the inclinations will exceed 3 in 1,000, and in the entire length of the road, being, as stated, 271,361 metres, this very inconsiderable maximum in elevation extends over 24,014 metres only, divided into five tracts, none of which exceeds 6,000 metres (or little more than three English miles) in length—all at some distance from each other, and in many instances favoured by a counter inclination, so that the locomotive engines may with perfect ease run the whole length of the line, without the assistance of additional power. Although this railway will traverse a country highly cultivated, the amount required for indemnities, for demolitions as well as decrease in value of buildings, &c., will scarcely reach 500,000 Austrian lires (about 17,000*l.*) The calculations of the lateral line from Bergamo to Triviglio are also rapidly approaching towards completion. The above results are deemed highly favourable, and have much increased the hope for the success of this splendid undertaking, which fairly promises an important increase to the prosperity of the port of Venice and all Lombardy.—*From a Correspondent of Gore's Liverpool Advertiser.*

Australia.—The thriving town of Sydney is now about to be supplied with water, on the catchwater system. Large reservoirs have been formed in distant marshes; and the water will be led by pipes, furnished by her Majesty's Board of Ordnance to *Hyde Park*, in that colony. Considerable difficulty has occurred in the levels; the Australian engineers being rough hands with the levelling staff. At present, the town is supplied by water-carts, and with a very bad article. The best house and shop in Sydney lets for about 1,500*l.* per annum; and so thriving is trade, that middling situations find ready customers at 150*l.* and 200*l.* per annum. When we consider that the large manufacturing towns of our own country;—Leeds, Bradford, Wakefield, &c., are still so indequately supplied with water, we cannot but admire the liberality and good sense of the New World, in so early providing themselves with the means of health and cleanliness.

MISCELLANEA.

Pontoon Bridge Building.—A trial of Colonel Blanshar's pontoons, or buoys, took place one day last week at Cuxton, nearly three miles above Rochester Bridge. The pontoon equipment having been landed on the Marsh, a bridge consisting of 20, pontoons at open order, extending 260 feet, was laid across the Medway in 20 minutes. Eight companies of Royal Marines then marched over, six deep, and returned at "double quick," four deep. A detachment of cavalry, consisting of one officer and 12 privates, passed over in files and returned in single ranks. Part of the bridge was then dismantled, and two rafts were formed of three pontoons each, and prepared for field pieces to fire from them. The remainder of the bridge was then broken into rafts, on board which about 130 Marines were conveyed down the river, and co-operated with an artillery and musketry fire in an attack made by a party of Marines on shore upon another party posted at the Cuxton limekiln; but the tide having fallen considerably, the troops and guns did not land from the rafts but proceeded to the gun wharf.—*Morning Post, August* 15.

Balloons.—In a long and elaborate memoir concerning the refraction of the atmosphere, read before the Academy of Sciences by M. Biot, that gentleman proposes, that each great observatory in Europe should be provided with fixed balloons, rising to different elevations, attaining the greatest possible height, and carrying self-registering instruments, of the requisite kinds, for the measurement of the physical elements which characterize the state of the air.

Sir John Herschel's Observations.—The Duke of Northumberland has munificently offered to defray the expense of reducing Sir John Herschell's invaluable astronomical observations in the Southern hemisphere. This is, indeed, the right use of wealth; an act worthy of the nobleman who holds the high position of President of the British Scientific Association.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH JULY AND 31ST AUGUST, 1838.

Wilton Wood, of Liverpool, in the County of Lancaster, Merchant, for "An improved method of mak ng Bands and Tackling, to be used in drawing, turning, or carrying Machinery."—26th July; 6 months.

George Holworthy Palmer, of New Cross, in the County of Surrey, Civil Engineer, and George Bertie Paterson, of Hoxton, in the County of Middlesex,

Engineer, for "Certain Improvements in the mode of preparing, constructing, and adapting certain parts of Gas Meters."—28th July; 6 months.

ANDREW PAUL, of Doughty Street, St. Pancras, in the County of Middlesex, Surgeon, A.B. and M.B., for "An improved Hydraulic Pump, Douche, or Jet d'Eau, applicable to all the purposes of Lavement in Medical Operations."—30th July; 6 months.

ROBERT HENDLY, of Belgrave Street, St. Pancras, in the County of Middlesex, Doctor of Medicine, for "A Metallic Concrete capable of being, by means of fire, cast into a variety of forms, and applied to a variety of purposes for which Iron, Lead, Zinc, Copper, and other Substances have been heretofore used."—30th July; 6 months.

SAMUEL HALL, of Basford, in the County of Nottingham, Civil Engineer, for "Improvements in Steam Engines, Heating or Evaporating Fluids or Gases, and Generating Steam or Vapour."—30th July; 6 months.

JOSEPH RAYNER, and JOSEPH WHITEHEAD RAYNER, of Birmingham, in the County of Warwick, Civil Engineers, and HENRY SAMUEL RAYNER, of Ripley, in the County of Derby, Civil Engineer, for their "Improvements in Machinery for Roving, Spinning, and Twisting Cotton, Flax, Silk, Wool, and other Fibrous Materials."—31st July; 6 months.

EDWARD HEARD, of Bateman's Buildings, Soho Square, in the County of Middlesex, Manufacturing Chemist, for "Certain Improvements in Oxydizing Lead, and converting the same into Pigments, or White and Red Lead, and Manufacturing part of the products arising from these processes into Soda."—1st August; 6 months.

GEORGE, MARQUESS OF TWEEDDALE, for an "Improved Method of Making Tiles for Drainings, Soles, House Tiles, Flat Roofing Tiles, and Bricks."—1st August; 6 months. To extend to the Colonies only.

EDWIN WHELL, of Walsall, in the County of Stafford, Tallow Chandler, for "An Improvement or Improvements in the Manufacture of Candles."—1st August; 6 months.

JOHN DENNETT, of New Village, in the Isle of Wight, in the County of Hants, Engineer and Surveyor, for "Improvements in War Rockets, and the methods and apparatus for applying the powers of Rockets, for the purpose of obtaining communication with Vessels which are stranded, or in other situations of danger; also an improved Instrument and Method for accurately Pointing Mortars for throwing Shells, which may likewise be used for Firing Shot from Mortars, for the purpose of obtaining communication with Ships."—2nd August; 6 months.

SAMUEL SANDERSON HALL, of the Circus, Minories, in the City of London, for "Improvements in Preserving certain Vegetable Substances from decay. Communicated by a Foreigner residing Abroad."—3rd August; 6 months.

THOMAS LUND, of Cornhill, in the City of London, Cutler, for "Improvements in extracting Corks from Wine and other Bottles with steadiness, facility, and safety."—3rd August; 6 months.

CHARLES BOURJOT, of Coleman Street, in the City of London, Merchant, for "Improvements in the Manufacture of Iron."—3rd August; 6 months.

ROBERT WILLIAM SIEVER, of Henrietta Street, Cavendish Square, in the County of Middlesex, Gentleman, for "Certain Improvements in Looms for Weaving, and in the Mode or Method of producing Figured Goods or Fabrics."—6th August; 6 months.

PIERRE ARMAND LE COMTE DE FONTAINEMOREAU, of Charles Street, City Road, in the County of Middlesex, for "Certain Improvements in Wool Combing. Communicated by a Foreigner residing Abroad."—6th August; 6 months.

RICHARD RODDA, of the Parish of St. Austle, in the County of Cornwall, Assay Master, for "Certain Improvements in Furnaces, Fire-places, and Stoves for the Consumption of Smoke and the saving of Fuel, and in the mode of applying them to the Generation of Steam, the Smelting of Metals, and other Works."—7th August; 6 months.

EUGENE DE BEURRET (commonly called VISCOUNT DE BEURRET), of 28, Moorgate Street, in the City of London, for "Certain Improvements in the Construction of Railroads and Tramroads to facilitate the ascent and descent of Hills and inclined Planes Communicated by a Foreigner residing Abroad."—10th August; 2 months.

MATTHEW HEATH, of Furnival's Inn, in the City of London, Gentleman, for "Improvements in preparing Tobacco, and in making Snuff. Communicated by a Foreigner residing Abroad."—10th August; 6 months.

THOMAS CORBETT, of Plymouth, in the County of Devon, Gardener, for "Certain Improvements in Heating Hot-houses and other Buildings."—10th August; 6 months.

DAVID CHEETHAM, Junior, of Staley Bridge, in the County of Chester, Spinner, for "Certain Improvements in the means of Consuming Smoke, and thereby economizing Fuel and Heat in Steam Engines, or other Furnaces or Fire places."—14th August; 6 months.

CHARLES WYE WILLIAMS, of Liverpool, in the County of Lancaster, Gentleman, for "Certain Improvements in the Process or the Mode of Purifying or Preparing Turpentine, Rosin, Pitch, Tar, and other bituminous matters, whereby he increases their Power of giving out Light and Heat either when Distilled or Burnt as Fuel."—14th August; 6 months.

WILLIAM HENRY PORTER, of Russia Row, Milk Street, Cheapside, in the City of London, Warehouseman, for "Improvements in Anchors."—15th August; 6 months.

RAMSAY RICHARD REINAGLE, of No. 13, George Street, London University, Royal Academician, and the Chevalier GEORGE ROBERT D'HARCOURT, of No. 6, King William Street, in the City of London, Civil Engineer, for "Certain Improvements in the means of Propelling Canal Boats, Steamers, and other Vessels."—15th August; 6 months.

GEORGE ROBERT D'HARCOURT, of King William Street, in the City of London, Civil Engineer, for "Improvements in the Manufacture of Paper. Communicated by a Foreigner residing Abroad."—15th August; 6 months.

CHARLES FOX, of No. 28, Gloucester Place, Camden Town, in the County of Middlesex, Engineer, for "An improved arrangement of Rails for the purpose of causing a Railroad Engine, Carriage, or Train, to pass from one Line of Rails to another."—15th August; 2 months.

MATTHEW WARTON JOHNSON, of Buckingham Place, in the County of Middlesex, Sculptor and Stone Mason, for "Improvements in the Construction of Coffins."—15th August; 6 months.

WILLIAM WAINWRIGHT POTTS, of Burslem, in the county of Stafford, China and Earthenware Manufacturer, for "Certain Improvements in Machines applicable to the Printing or Producing Patterns in one or more Colours, or Metallic Preparations to be transferred to Earthenware, Porcelain, China, Glass, Metal, Wood, Cloth, Paper, Papier Mache, Bone, Slate, Marble, and other suitable substances."—21st August; 6 months.

NICHOLAS TROUGHTON, of Broad Street, in the City of London, Gentleman, for "Improvements in the Process of obtaining Copper from Copper Ores."—21st August; 6 months.

SAMUEL STOCKER, of the City of Bristol, Machinist, for "Improvements in Chimneys for Dwelling-houses, and in Apparatus for Scraping, Sweeping, or Cleaning Chimneys, and in the Manufacture of such Apparatus and of the Materials of which such Chimneys are formed."—21st August; 6 months.

RICHARD BRADLEY, WILLIAM BARROWS, and JOSEPH HALL, of Bloomfield Iron Works, in the Parish of Tipton, in the County of Stafford, Iron Masters and Copartners, for "An Improved Method or Means of Making Iron."—21st August; 6 Months.

JEAN LEANDRE CLEMENT, of Rochfort, in the Kingdom of France, but now of Janney's Hotel, Leicester Square, in the County of Middlesex, Gentleman, for "Improvements for ascertaining and indicating the Rate of Vessels passing through the Water."—21st August; 6 months.

PIERRE ARMANDE LE COMTE DE FONTINEMOREAU, of Charles Street, City Road, in the County of Middlesex, Gentleman, for "Certain new and improved Metallic Alloys, to be used in various cases as substitutes for Zinc, Cast Iron, Copper, and other Metals."—23rd August; 6 months.

GEORGE DICKINSON, of Wood Street, Cheapside, in the City of London, Paper Manufacturer, for "An Improvement or Improvements upon Steam Engines."—23rd August; 6 months.

ARTHUR DUNN, of Stanford Hill, in the County of Middlesex, Gentleman, for "Certain Improvements in the manufacture of Soap."—24th August; 6 months.

JOHN COOPE HADDAN, of Bazing Place, Waterloo Road, in the County of Surrey, Gentleman, for "Certain Improvements in the construction of Carriages to be used on Railways, and of the method of forming the same into Trains."—25th August; 6 months.

HENRY KNILL, of Eldon Place, Bermondsey, for "Improvements in Cleansing the Bottoms of Docks, Rivers, and other waters."—30th August; 6 months.

JOHN GRAFTON, of Cambridge, Civil Engineer, for "Certain Improvements in the Construction of Retorts, and other Machinery for Making Gas from Coal and other Substances"—30th August; 6 months.

JOSEPH DAVIES, of Nelson Square, in the county of Surrey, Gentleman, for "A Composition for Protecting Wood from Flame."—30th August; 4 months.

WILLIAM DOLIER, of Liverpool, in the county of Lancaster, Lecturer on Education, for "A Certain Durable Surface or Tablet for the Purpose of receiving Writings, Drawings, or Impressions of Engravings, or other Devices, capable of being Printed, which Surface may be applied for Roads or Pavements, and part of which Invention may also be used as the Means of Strengthening or Beautifying Glass."—30th August; 6 months.

MILES BERRY, of 66, Chancery Lane, Patent Agent, for "Certain Improvements in Looms for producing Metallic Fissures, and also Improvements in such Fissures applicable to the Making of Buttons, Epaulettes, Tassels, and other purposes, for which Gold and Silver Lace, or Braiding is commonly employed, and to the Making of Imitations of Jewellery and other Fancy Articles."—30th August; 6 months.

LAWRENCE HEYWORTH, of Yewtree, near Liverpool, Merchant, for "A new Method of Employing Steam Power directly to the Periphery of the Movement Wheel, for the purposes of Locomotion, both on Land and Water, and for Propelling Machinery."—30th August; 6 months.

JOHN EARLE HUXLEY, of Great Marlborough Street, JOHN EARLE HUXLEY, jun., of the same place, and JOHN OLIVER, of Dean Street, Soho, Stove Makers, for "Improvements in certain descriptions of Stoves."—31st August; 6 months.

WILLIAM JOSEPH CURTIS, of Stamford Street, Blackfriars Road, Civil Engineer, for "Certain improved Machinery and Apparatus for facilitating travelling and transport on Railways, parts of which are also applicable to other Purposes."—31st August; 6 months.

NOTICES TO CORRESPONDENTS.

We have received a communication from Mr. Davy, complaining of our remarks in the last month's Journal relative to his drawing of the Tower and Spire of St. Vedast, exhibited at the Royal Academy. If we are not sufficiently explicit in our comments, we are sorry for it. Our opinion is, that drawings otherwise than original designs, ought not to be exhibited in the Architectural Room, excepting under very particular circumstances. Mr. Davy alludes to our remarks relative to "The Loggia of the Villa Madama," designed by Mr. Moore, and says that that drawing is not a whit more original than his. True, it may be so; but we consider that as a truly beautiful *artistic* drawing, exhibiting great judgment and taste in the perspective and colouring; which is not the case with Mr. Davy's drawing. In making this remark we do not mean to deny that Mr Davy's drawing is very accurately executed, and that very great labour has been bestowed in ascertaining the measurement of the Tower, "from the vane to the base." We should not have the slightest objection to see a room in the Academy set apart for drawings of this description, that students might have an opportunity of studying *construction*, which we consider a most important part of the studies of an Architect; but as long as the exhibition of Architectural Drawings is confined to one small room, we must protest against the introduction of any drawings, excepting original designs.

We have not space to insert Mr. Parker's communication. We shall be happy to hear from him on some other subject.

We are obliged to a correspondent for two pamphlets relative to Girard College, now erecting at Philadelphia. We had intended to notice them in the present Journal, but we have been obliged to postpone our extracts until next month; this is also the case with the reports of the Carlisle and Glasgow Railway, and the Glasgow and Ayr Railway Reports, and some other communications.

We must refer "An Architect" for the information he requires, to the Literary Gazette, where notice of Messrs. Gwilt's scheme first appeared.

The letter of W. L. B. on Friction-wheel Carriages, is in type, but postponed for want of room.

Communications should be sent on or before the 20th inst.; (not the 25th, as stated by mistake in last number) *if accompanied with drawings, still earlier.*

The publication of our twelfth number reminds us of our intention to complete the first volume of the Journal in December next; when an index and title page will be supplied, price 6d.

OBSERVATIONS ON BRICK BOND.

Old English Bond.

Fig. 1.

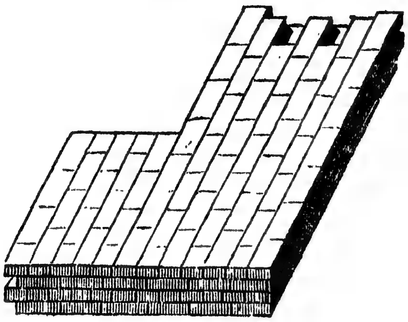
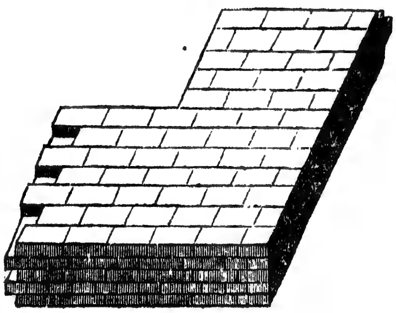


Fig. 2.



Flemish Bond Facings,

Showing the defects they occasion in the internal structure of Walls.

Fig. 3.

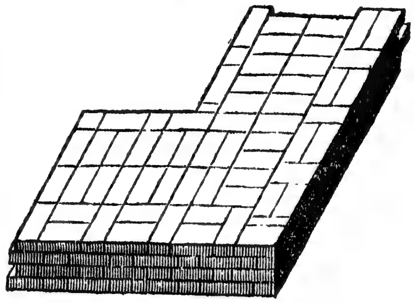


Fig. 5.

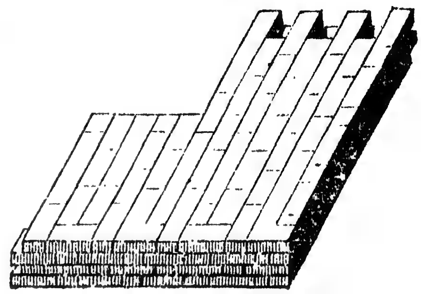


Fig. 4.

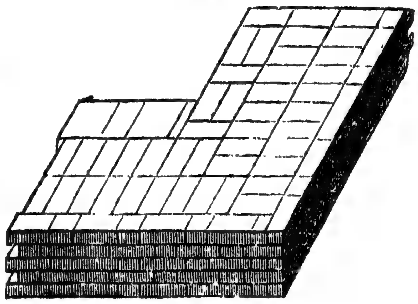
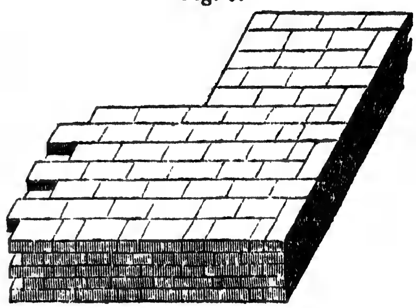


Fig. 6.



Flemish Bond Facings.

Fig. 7.

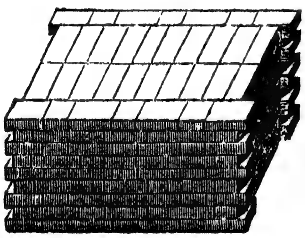


Fig. 8.

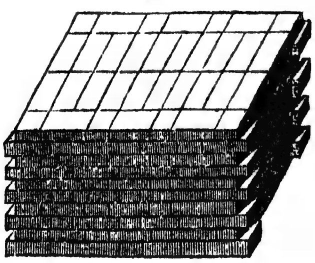


Fig. 9.

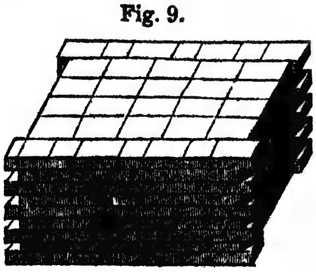


Fig. 10.

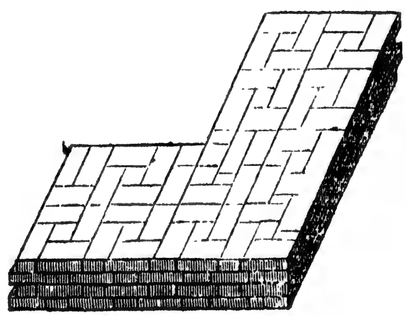
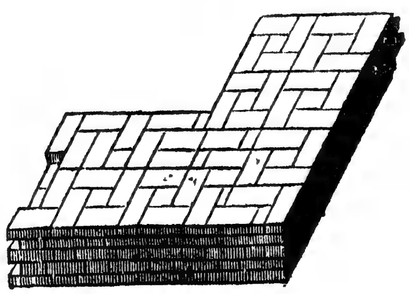


Fig. 11.



The upper surfaces of the figures, in each perpendicular line, show the alternate courses of the same wall.

OBSERVATIONS ON BRICK BOND,

AS PRACTISED AT VARIOUS PERIODS; CONTAINING AN INVESTIGATION OF THE BEST DISPOSITION OF BRICKS IN A WALL, FOR PROCURING THE GREATEST POSSIBLE STRENGTH; WITH FIGURES REPRESENTING THE DIFFERENT MODES OF CONSTRUCTION.

[The following Observations were published in the form of a pamphlet, in 1805; we understand that they were from the pen of Mr. G. Saunders, a highly respectable member of the profession. They appear to us of a nature particularly valuable to the student; and as they have been for some time out of print, we are induced to re-publish the pamphlet entire. A copy of the work has been obligingly furnished to us by Mr. Donaldson, the Honorary Secretary of the Royal Institute of British Architects.]

Introduction.

The strength of a brick-wall depending very much on the arrangement of the materials, a clear investigation of the best mode becomes a consideration of importance. The following observations are presented with a view of engaging general attention to the subject, under the full conviction, that, as a matter of public utility, every one must feel an interest in promoting the intended object.

Figures are given of different modes that are, or have been practised; which, for the greater convenience of comparison, are delineated together on one page.

Observations, etc.

When two contiguous bricks have a third opposed to the joint that is between them, a part of the third being against one of the two first, and the remaining part against the other, a connexion is formed between the three bricks, tending to confine them to their respective situations, and is called *bond*.

Stretching bond is where the longitudinal direction of the bricks is parallel with the face of the wall, and consequently presents the whole length of the bricks on the outside.

Heading bond is where the longitudinal direction of the bricks makes a right angle with the face of the wall, and consequently presents the ends of the bricks on the outside.

Old English bond is a continuation of one kind throughout the same course, or horizontal layer: the courses are alternately all of stretchers; and all of headers; see Fig. 1 and 2. The stretching courses bind the parts of the wall together in the longitudinal direction, and the heading courses bind them in the transverse direction: it is chiefly on this account that old English brickwork is remarked not to separate at the joints; but when a fracture occurs, by its being greatly undermined, it breaks as any other solid body, such as stone of one piece would do. It is easy to conceive that a wall constructed in this mode must have considerable strength, for the parts of a wall are less liable to separate the longer the bonds are: the bonds are greatest in he longitudinal direction of the bricks, for then one brick may be four nches in length against each of two others in the same course; which is the tength that must be moved before they can separate without breaking.*

What is called *Flemish bond*, see Fig. 7, 8, 9, &c. consists in the disposition of the bricks on the outside, or face work, so that in the same course there shall be alternately a stretcher and a header: this mode was introduced, together with other Dutch fashions, about the reign of William and Mary, as may be ascertained by observing the works of brick prior and subsequent to that period. Strength was then sacrificed to a minute difference in the outside appearance; and bricks of two qualities were fabricated for the purpose; a fine brick, often to be rubbed and laid in what is called a close putty joint, for the exterior; and an inferior coarse brick for the interior substance of the wall: as these did not correspond in thickness, the exterior and interior of the wall could not be otherwise connected together than by an outside heading brick that was here and there continued of its whole length, where the exterior and interior courses happened to admit of it, which might not occur for a considerable space. The evil increased so far, that walls are found to consist of two separate outside faces of four inches each in thickness; and the interior substance of little better than rubbish. Yet the practice of using Flemish bond has continued ever since, and workmen are now become estranged from any other, except in a few accidental instances.

Not aware from whence the evil proceeds, considerate bricklayers have projected various schemes for obviating the defects in working with Flemish bond: these defects are, in one or both faces, bulging away from the interior substance; or the failure of the wall, by its separating into two thicknesses along the middle, which sometimes takes place when there is a great superincumbent weight on it, and is called splitting; this is the great terror of a bricklayer. To prevent the evil some lay laths, or the iron of hoops occasionally, in the horizontal joints between two courses: others lay diagonal courses of bricks at certain heights from each other; but the good effect of this last mode is much doubted, as in the diagonal course, by not being continued to the outside, the bricks are much mangled where strength is wanted. Others again lay all heading courses within the outside Flemish bond, a practice in great repute, making the face work alternately of nine and of four inches in thickness (see Fig. 3 and 4); this, as far as relates to the splitting of the wall, is an effectual preventive; but in curing one evil another is increased, for here is no stretching bond; the little that occurs in Flemish bond face work being too trifling to be of any avail: so that the least inequality of settlement, or weight, in the longitudinal direction of the wall, occasions a separation at the vertical joints, as may be often seen in the fronts of buildings: even if longitudinal courses should be directed to be alternately laid in the interior of the wall, there is little chance of succeeding better. In Fig. 5 and 6, the interior bricks are disposed with attention to combine complete bond as much as possible with Flemish facings, under the most favourable circumstance, the Flemish facings being only on one side of the wall: this at the best falls short of the quantity of bond produced in the old English manner; and although master bricklayers generally wish to have their work well done, few would expect this intricate disposition of the bricks to be followed in many yards of work, where the adjustment of the bricks in one course depends upon the position of those in the course beneath, for the under course requires to be seen or recollected. When the Flemish facings occur on both sides of the wall, they furnish no indication of the interior adjustment, for every course is similar on the outside. The interior of the under course is not seen, on account of being covered with mortar for the bed of the next course; and to recollect how every brick was laid beneath is more than can be expected from men who are dispatching work, and moving to distant parts in the performance of it. The work will, by inadvertence, approach that represented in Fig. 7, 8, and 9, producing continued joints that divide the wall into several thicknesses, where the separation, or splitting as it is termed, usually takes place. In the old English bond, a workman cannot easily lose his way; for the outside of the last course shows him how the next is to be laid. It may be also observed that in the same course there cannot be both stretching and heading bond with complete effect throughout one line of wall; for wherever the stretching bond is crossed by the heading bond, the continuity and effect of stretching bond is destroyed; therefore the mixed position of the bricks, represented in Fig. 10 and 11, will not answer, and it often produces a perpendicular joint in the middle of the thickness, dividing the substance into two walls.

The outside appearance is all that can be advanced in favour of Flemish bond; of this, however, opinions are far from being in accord: of those who have considered the subject, some allege, that if the courses were alternately of stretchers and of headers, which is the old English bond, executed with the same neatness usually shewn in Flemish bond, it would be equally, or more pleasing. It is of great importance that all concerned in directing the construction of brick walls should urge the rejection of the Flemish fashion.* The difference between the Flemish and the old English bond in the outside appearance, is really too minute to be observed by the generality of people: and even those who are in the constant habit of examining such works, must look closely at them, before they can make the distinction. Bricklayers of credit will readily follow the old English practice, as it is the easiest to be executed, and occasions no extraordinary waste; the only directions required to be given are these:

Each course is to be alternately of stretchers and of headers.

Every brick in the same course is to be laid in the same direction; but in no instance is a brick to be placed with its whole length along the side of another: but to be so situated, that the end of one may reach to the middle of the others that lie contiguous to it; except in the outside of the stretching course, where three quarter bricks necessarily occur at the ends to prevent a continued upright joint in the face work.

A wall which crosses at a right angle with another, will have all the bricks of the same level course, in the same parallel direction, which completely bonds the angles. See Figs. 1 and 2.

* The ancient Roman bond is, in principle, the same as the old English bond. The Roman walls that now remain are generally of great thickness, and have three, or sometimes more, courses of brick laid at certain intervals of the height, stretchers upon stretchers; and *vice versa* opposite the return walls, and sometimes at certain distances in the length, forming piers that bind the wall together in the transverse direction; the intervals between these piers of brick are filled up, and form panels of rubble or reticulated work; consequently great substance with strength was economically obtained.

* The Act of Parliament which regulates the size of bricks, directs that they shall not be less than 8½ inches in length, 4 inches in breadth, and 2½ inches in thickness. The brickmakers now make their moulds to produce bricks of that size. The breadth of two bricks together, with one vertical joint, should be equal to the length of a brick; the vertical joint must therefore be half an inch in thickness, according to the present make of the bricks, which is too much for neat work. The framers of the Act undoubtedly had respect to the accustomed mode of reckoning the thickness of a wall by so many bricks; or so many times nine inches as the thickness of the wall contained; which, allowing a quarter of an inch, as being ample for a vertical joint, requires the brick to be 8¾ inches in length, and 4¼ inches in breadth, in order that two breadths together, with a quarter of an inch for the vertical joint, may be equal to the length of a brick. The size mentioned by the Act was probably for the purpose of making an allowance for any accidental variation that might occur in the burning of bricks; and the Act limited the smallest proportion that was to be admitted in such a case; but as advantage has been taken to make the bricks to the least size expressed in the Act, it is highly necessary that the limitation should be altered to what good brickwork requires, viz. 8¾ inches in length, 4¼ inches in breadth, and 2½ inches in thickness.

REVIEWS.

Geology as a Science applied to the Reclamation of Land from the Sea, the Construction of Harbours, the Formation of Railways, and the Discovery of Coal, with an assumed outline Map of the Granite Formation of the Earth. By John Rooke, Esq. London: Ridgway. 1838.

It may be considered, as a step in the progress of engineering science, that it should be thought susceptible of an immediate application of Geology to its purposes, and we hail with pleasure the appearance of the present work. The object of it is first to elucidate the general formation of the earth, on simple principles, and then to show the application of engineering to the surface of the British Islands. In carrying out these objects, the author proceeds on a different course from those generally received, and although it is not compatible with our objects to enter into his general theory, we can say that there is much in it which bears the stamp of truth and reason. His theory is that of a Neptunian formation, by a great tidal wave, which he supposes to be at present in activity, although on a diminished scale. Attached to his work is a sketch of the great tidal basin of the Atlantic, surrounded with a granitic chain of mountains, containing the greater part of the land and depositions of the globe, and one half of the population, with the great tidal vortex, the north pole, and the magnetic poles in Siberia and the Gulf of Boothia. This presents an accumulation of the physical features of the globe, which cannot be thus assembled without some immediate and definite connexion.

However, our object being more with the professional part of the work, we must leave the philosophic portion, and come to what is more immediately within our sphere. Having shown the formation of the oceanic basins in the 5th chapter, he proceeds to consider the formation of harbours on the English coasts. After an examination of the action of the tides and their tendency to deposit itself on particular points, he proceeds to consider the several positions on the north-west coast, the Wash, and the Thames.

The different estuaries on the coasts of Lancashire and Cheshire may be estimated at 200,000 acres in extent. Namely—

In the Dee	36,000 acres.
— Mersey	27,000 „
— Ribble	28,000 „
In Morecambe Bay	96,000 „
In the Duddon	13,000 „
Total	200,000 acres.

Showing this extent of ground dry at low water, he proceeds to recommend its reclamation by the diversion of the several land streams which flow over it. Mr. Rooke thus alludes to the proceedings of the River Dee Company :—

Having said thus much on the estuaries of the Mersey and the Ribble, it need be remarked on the Dee only, that the embankment company there formed have commenced their works at the wrong end. Instead of co-operating with the tidal action of the estuary, they work against it, and in some measure fail in reaping the highest results attainable to both navigation and themselves. In place of amending the navigable channel, which, by starting at the point of Air on the south, and at Little Meoles on the north, they would have been sure to do, as well as gaining the most land, their unskilful proceedings have ruined Chester as a port.

With regard to the reclamation of Morecambe Bay, which now attracts great attention in the north of England, the author observes :—

Means of diverting the great central stream of the Bay to either of its sides, and finally carrying the body of water to the verge of the Irish Sea, would evidently convert those waters into the instrument required. So placed, their volume and force would then contribute to break a powerful flux in the Irish Sea, and leave no cause of return to the vast masses of silt which the flowing tide propels into the area of the Bay, but which the central stream is continually forcing out to sea again. In the course of two years depositions have been known to form on an area as much as 20 square miles in extent, and from five to eight feet in depth, even under the sweeping influence of this great central stream of backwater, which we should purpose carrying on the northern line of the Bay, or more full consideration might decide in turning it southwards into the river Lune. It may be asked, indeed, why not embank the sea at once? We should answer that such a work would seem impracticable; and if it were practicable, a vast extent of low lying and almost worthless silicious beds would not repay the cost of embankment so well as reclaimed land silted over on right principles; an objection which silting up fully answers. * *

Sandy materials being naturally the first deposited, and finer and lighter materials being borne further on land, so they remain on the surface, where self-reclamation is adopted, and form a fruitful super-soil. Hence, fine and fertile particles, which vast inland drains are constantly driving into Morecambe Bay, would be assorted from barren ones, by a tidal process, and undergo deposition the uppermost. In all alluvial tracts of country, this law of deposition is manifest, and is a reason why alluvian affords so much fertile land. Mere sands embanked and reclaimed at once, can seldom afford land of much value. * *

So weighty a body of water as the rivers Ken, Leven, and Duddon, emptying themselves into Fowdry and its channels, could not fail in occasioning a powerful scour within, and on the entrances of this vast and secure roadstead. Nor is this all. The very steps which are favourable to the acquisition of such an object, are equally adapted to the reclamation of Morecambe Bay, and the estuary of the Duddon from the Sea. Preparing the way for the construction of a line of railroad that would give a speedy and easy communication between Cumberland on the north, and Lancashire on the south. Opening out at the same time a direct route of railroad, between the south of Scotland, through the west of Cumberland, and the south of England; embracing in a comprehensive plan national objects of vast importance, attainable only by the means here advocated, and through the portions of the kingdom just described. * *

In casting the eye on the vast attainable acquisitions which appear on the coasts of Lancashire and Cheshire, in the estuary of the Solway Frith, that of the Wash, and the Thames, they may be viewed as objects of great national importance. The mere reclamation of land from the sea is not the sole consideration, but the facility and security of navigation on one-third of our English shores, besides giving the cheapest and best direction to railroads, and thereby effecting the most speedy communications between the different parts of the empire. We may be well allowed to express some surprise that national attainments so important should have been so far neglected, the more especially as they offer to the speculator ample and sure returns of profit, and might well rouse the attention of government and the legislature. Now that railroads have become essential to the preservation of our high station among the various nations of the earth; as Morecambe Bay and the Solway Frith, sever almost the inland communications of England, Scotland, and Ireland, they surely claim intense national interest. Not overlooking at the same time the grievous consequences of a false direction given to capital in the construction of railways on lines where the cost is enormously high, undulations and curves exceedingly objectionable, the working powers expensive, and the communications from some parts of the empire to others tardy and dangerous; even passing through sections of the kingdom all but barren, avoiding the fruitful plains, manufacturing workshops, and commercial storehouses of north Lancashire, and western Cumberland.

Upon the means of removing Tynemouth Bar at the entrance of the river Tyne, there are the following remarks :—

On ordinary principles of physics it is obvious that a river crossing a tide-wave suddenly, or at right angles, must occasion a bar; while two angles running on slow progressions into each other, must contribute materially to obviate the objection, and give the desideratum sought for, a flowing stream from an inland drain, working conjointly with a flowing tide, so that a deposition of silt no longer occurred in the extreme angle of their junction. For two currents crossing each other at right angles, of which the deposition of the south-east section of our island is a striking illustration, have a tendency to drive each o'her away, and necessarily place a line of sedimentary depositions between them. Hence the Strait of Dover is kept open by an eastern and western tide-wave abutting on the coast of France.

In the 6th chapter, investigating the most favourable lines for Railways, is given the following opinion :—

Geology points out the leading features of the ground on which it is proposed to construct these several lines of railway. As the different formations of which our island is composed have been chiefly deposited by currents which have flowed from north-east to south-west, it is obviously a general rule, that following the courses of these currents must contribute to cheapen the formation of railways, and facilitate locomotion, much more than going transversely over them, or from north-west to south-east; and it must prove still more difficult and disadvantageous to cross the Penine chain of hills in the north of the kingdom, where either the secondary or the tertiary formations abound, until the red sandstone group appears. * * We find beside a series of plans which stretch from the basin of London and Bristol, to the Solway Frith, and lying on the western borders of the kingdom. A similar plain is extended along the eastern borders of the kingdom from the London basin to Newcastle-upon-Tyne. * *

It is comparatively easy to obtain an advantageous line from Newcastle-upon-Tyne to London; from London to Cheltenham by the valley of the Thames, with a lateral branch to Bristol, and the south-west counties of England generally. From Cheltenham a plain also runs directly northwards as far as Dumfries and Carlisle, by the valleys of the Severn and the Weaver, along the vast levels of the red sandstone group, and by the diluvial and alluvial depositions on the west of Lancashire, across Morecambe Bay, the estuary of the Duddon, and by the western shore of Cumberland across the Solway Frith to Dumfries, and laterally to Carlisle. The entire track of this great line of continuous levels is scarcely undulating, on a low general level, and remarkably straight, considering its length and the varied directions of its lines.

Mr. Rooke objects particularly to the course of the Birmingham Railway, and at great length urges the preference of a line by Cheltenham, Worcester, and Wolverhampton, to Liverpool.

The vital error of carrying railroads across geological ribs of iron, in preference to traversing smooth and plastic plains, where nature cheers art

onwards in every form, is manifest, cannot be denied, and is sure to be remedied in due season. In a day when millions of money are either in course of expenditure on railways through almost every part of the kingdom, or projected, general levels ought to be taken forthwith, and the most advantageous lines ascertained. * *

No sooner are we across the river Mersey northwards, than we find an unbroken plain extended from Warrington to Preston and Lancaster. Here the question arises of crossing Morecambe Bay on the one hand, or scaling the vast and continuous primary Isle of Cumberland and Westmorelond on the other. * *

A railroad is certain to be completed on the line here marked out, regardless of the previous follies of any rival company whatever. From London to Dumfries, by the valleys of the Thames, the Severn, and the Weaver, with the plains of Lancashire and western Cumberland in continuation, leading across the Solway Frith to Tordiff Point, presents the longest chain of level ground and straight lines of which our island may boast. Not to say the wealth, the manufactures, the commerce, and marine affairs which lie upon and touch this great line of levels. Nor is this all.

Viewing the line here traced out as a common base to numberless ascending vales, a denial of our proposition might seem a denial of all just rules of science and common fairness. For the geological reasons assigned, central England ought to be turned rather than crossed, and its rugged undulations and sharp curvatures avoided as much as may be.

As a temporary line to Glasgow, which might be worked in less than thirty hours, the author recommends Mr. Hyde Clarke's plan, of proceeding by the Birmingham, Grand Junction, and Preston and Wyre Railways to Wyreton, thence by steam-boat to Wigton Bay, and thence to join the Glasgow and Paisley Railway at Ayr.

We regret that it is not in our power to go farther into a work which abounds so much with local detail, as to render it almost impossible to detach any particular part. There is much valuable information and criticism on the railways and harbours in the north of England, and much light thrown as well upon the local incidents, as upon the general laws by which they are regulated. To the professional reader it cannot fail to afford much information, while it is equally interesting to the philosopher or the agriculturist. A considerable portion is devoted to a discussion on the formation of the coal beds, in illustration of the prevailing theory of their being composed of wood drift. In conclusion, we earnestly recommend to the reader to judge for himself, and he will find this work the more useful, as its portable contents are devoted principally to our country, and not to any discursive geological discussion.

Perspective Simplified, or the Principles of the Art, as laid down by Dr. Brook Taylor, familiarly Illustrated. By Z. Laurence. With nine Plates. 8vo. London: 1838.

Perspective is a science so fixed by the mathematical laws of vision, as to admit of no fresh discoveries being made in it, no new principles established, notwithstanding that Mr. Parsey plumes himself not a little upon having made what he considers a most notable discovery,—namely, that vertical lines visibly converge, and ought to be so represented; that is, the upper part of a lofty building, as he contends, should be narrower in a drawing than its breadth at the level of the eye. How many converts he may have is best known to himself, for we have not yet seen any practical application of his valuable discovery, and will venture to say that we never shall. Neither do we find that Mr. Laurence has even so much as mentioned it, although he speaks of several treatises on the subject in his preface, where he very sensibly remarks: "The main improvement that suggested itself to me, was *concentration; to concentrate* the subject into a few of the most essential theorems and problems, applying them to plain examples illustrated in the most familiar manner."

Undoubtedly such is the case, for the study has been so overlaid with rules, intended to meet every possible case which may arise, that most persons feel alarmed, if not bewildered, at the very outset. Yet, on the other hand, too little may be attempted no less than too much, the consequence of which will be, that for want of a full, as well as *familiar* explanation, the student will still remain at a loss, and not know how to proceed, when he comes to apply the rules by himself. Accordingly, however briefly the rules may be laid down, they ought to be accompanied by such remarks as may tend to impress them on the memory, and to show how the very same principle applies to a variety of cases apparently very different, yet in reality alike, as far as principles are concerned. To be brief, is not always to be familiar in explanation; neither is to be familiar, invariably to be exact and intelligible: and this, we are compelled to observe, is in some degree the case with Mr. Laurence. Consequently his book requires to be studied with the utmost attention and reflection on the part of the reader who brings to it no previous acquaintance with the subject. So far it is rather a compendium than a simplification of the principles laid down; as such an abridgment we can recommend it, and certainly as a work entirely free from that mystification which, whether intentional or not, stamps many other treatises professing to have the same object.

A Dictionary of Arts, Manufactures, and Mines; containing a clear Exposition of their Principles and Practice. By Andrew Ure, M.D. To be completed in Ten Monthly Parts, with upwards of 1000 Engravings on Wood. Part I, 8vo. London: Longman and Co. 1838.

From the specimen before us, this appears likely to be a valuable work, which not only treats of the application of chemistry to the arts and manufactures; but it also enters very fully into the mechanical arrangement of the buildings, the plants, and implements of a great variety of trades, on which it communicates much lucid and well arranged information. It is compiled with great care, and besides containing the latest materials is strictly confined to what is useful, without superfluous detail. In the present part are some few articles which more immediately bear upon our pursuits, and in that on alabaster are some interesting particulars relative to the curious carbonic spring of San Filippo, in Tuscany, where works of artificial alabaster are produced.

We extract the article on Artesian Wells, which contains a compendium of information on this interesting subject, now exciting considerable attention in many districts of the metropolis.

Artesian Wells.—Under this name is designated a cylindrical perforation, bored vertically down through one or more of the geological strata of the earth, till it passes into a porous gravel bed containing water, placed under such incumbent pressure as to make it mount up through the perforation, either to the surface or to a height convenient for the operation of a pump. In the first case, these wells are called spouting or overflowing. This property is not directly proportional to the depth, as might at first sight be supposed, but to the subjacent pressure upon the water. We do not know exactly the period at which the borer or sound was applied to the investigation of subterranean fountains, but we believe the first overflowing wells were made in the ancient French province of Artois, whence the name of Artesian. These wells, of such importance to agriculture and manufactures, and which cost nothing to keep them in condition, have been in use, undoubtedly, for several centuries in the northern departments of France, and the north of Italy; but it is not more than fifty or sixty years since they became known in England and Germany. There are now a great many such wells in London and its neighbourhood, perforated through the immensely thick bed of the London clay, and even through some portions of the subjacent chalk. The boring of such wells has given much insight into the geological structure of many districts.

The formation of Artesian wells depends on two things, essentially distinct from each other: 1. On an acquaintance with the physical constitution, or nature, of the mineral structure of each particular country; and, 2. On the skilful direction of the processes by which we can reach the water level, and of those by which we can promote its ascent in the tube. We shall first treat of the best method of making the well, and then offer some general remarks on the other subjects.

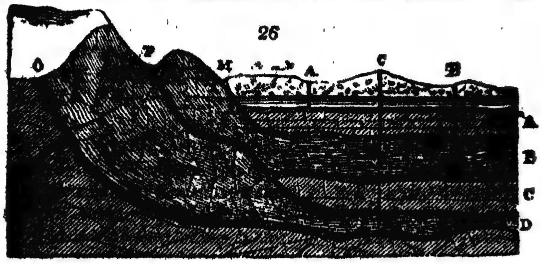
The operations employed for penetrating the soil are entirely similar to those daily practised by the miner, in boring to find metallic veins; but the well excavator must resort to peculiar expedients to prevent the purer water, which comes from deep strata, mingling with the cruder waters of the alluvial beds near the surface of the ground, as also to prevent the small perforation getting eventually filled with rubbish.

The cause of overflowing wells has been ascribed to a variety of circumstances. But, as it is now generally admitted that the numerous springs which issue from the ground proceed from the infiltration of the waters progressively condensed in rain, dew, snow, &c., upon the surface of our globe, the theory of these interior streamlets becomes by no means intricate; being analogous to that of syphons and water jets, as expounded in the treatises of physics. The waters are diffused, after condensation, upon the surface of the soil, and percolate downwards, through the various pores and fissures of the geological strata, to be again united subterraneously in veins, rills, streamlets, or expanded films, of greater or less magnitude, or regularity. The beds traversed by numerous disjunctions will give occasion to numerous interior currents in all directions, which cannot be recovered, and brought to the day; but when the ground is composed of strata of sand, or gravel very permeable to water, separated by other strata nearly impervious to it, reservoirs are formed to our hand, from which an abundant supply of water may be spontaneously raised. In this case, as soon as the upper stratum is perforated, the waters may rise, in consequence of the hydrostatic pressure upon the lower strata, and even overflow the surface in a constant stream, provided the level from which they proceed be proportionally higher.

The sheets of water occur principally at the separation of two contiguous formations; and, if the succession of the geological strata be considered, this distribution of the water will be seen to be its necessary consequence. In fact, the lower beds are frequently composed of compact sandstone or limestone, and the upper beds of clay. In level countries, the formations being almost always in horizontal beds, the waters which feed the Artesian wells must come from districts somewhat remote, where the strata are more elevated, as towards the secondary and transition rocks. The copious streams con-

densed upon the sides of these colder lands may be therefore regarded as the proper reservoirs of our wells.

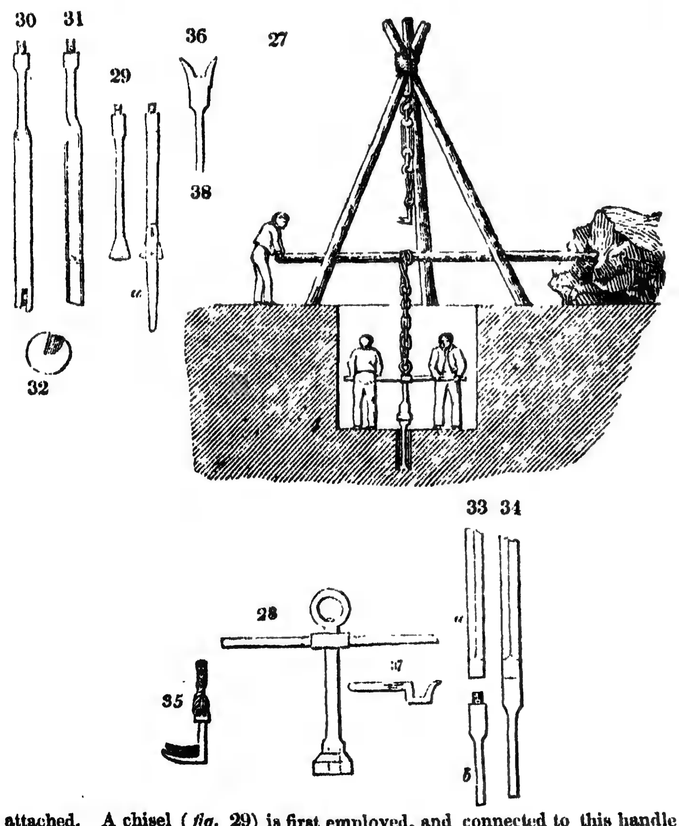
Fig. 26 represents the manner in which the condensed water of the



heavens distributes itself under the surface of our globe. Here we have a geological section, showing the succession of the several formations, and the sheets or laminæ of water that exist at their boundaries, as well as in their sandy beds. The figure shows also very plainly that the height to which the water re-ascends in the bore of a well depends upon the height of the reservoir which supplies the sheet of water to which the well is perforated. Thus the well A, having gone down to the aqueous expanse *a a*, whose waters of suppy are derived from the percolation M, will afford rising waters, which will come to the surface; whilst in the well B, supplied by the sheet P, the waters will spout above the surface, and in the well C they will remain short of it. The same figure shows that these wells often traverse sheets of water, which rise to different heights. Thus, in the well C there are five columns of ascending waters, which rise to heights proportional to the points whence they take their origin. Several of these will be spouting or overflowing, but some will remain beneath the surface.

The situation of the intended well being determined upon, a circular hole is generally dug in the ground, about six or eight feet deep, and five or six feet wide. In the centre of this hole the boring is carried on by two workmen below, assisted by a labourer above, as shown in *fig.* 27.

The handle (*fig.* 28) having a female screw in the bottom of its iron shank, with a wooden bar or rail passing through the socket of the shank, and a ring at top, is the general agent to which all the boring implements are to be



attached. A chisel (*fig.* 29) is first employed, and connected to this handle by its screw at top. If the ground is tolerably soft, the weight of the two workmen bearing upon the cross bar, and occasionally forcing it round, will soon cause the chisel to penetrate; but if the ground is hard or strong, the workmen strike the chisel down with repeated blows, so as to peck their way, often changing their situation by walking round, which breaks the stones, or other hard substances, that may happen to obstruct its progress.

The labour is very considerably reduced, by means of an elastic wooden pole, placed horizontally over the well, from which a chain is brought down, and attached to the ring of the handle. This pole is usually made fast at one end, as a fulcrum, by being set into a heap of heavy loose stones; at the other end the labourer above gives it a slight up and down vibrating motion, corresponding to the beating motion of the workmen below, by which means the elasticity of the pole in rising lifts the handle and pecker, and thereby very considerably diminishes the labour of the workmen. See *fig.* 27.

When the hole has been thus opened by a chisel, as far as its strength would permit, the chisel is withdrawn, and a sort of cylindrical auger (*fig.* 30) attached to the handle (*fig.* 28), for the purpose of drawing up the dirt or broken stones which have been disturbed by the chisel. A section of this auger is shown in *fig.* 31, by which the internal valve will be seen. The auger being introduced into the hole, and turned round by the workman, the dirt or broken stones will pass through the aperture at bottom (shown at *fig.* 32), and fill the cylinder, which is then drawn up, and discharged at the top of the auger, the valve preventing its escape at bottom.

In order to penetrate deeper into the ground, an iron rod, as *a*, *fig.* 33, is now to be attached to the chisel, *fig.* 29, by screwing on to its upper end, and the rod is also fastened to the handle, *fig.* 28, by screwing into its socket. The chisel having thus become lengthened, by the addition of the rod, it is again introduced into the hole; and the operation of pecking or forcing it down, is carried on by the workmen as before. When the ground has been thus perforated, as far as the chisel and its rod will reach, they must be withdrawn, in order again to introduce the auger, *fig.* 30, to collect and bring up the rubbish; which is done by attaching it to the iron rod, in place of the chisel. Thus as the hole becomes deepened, other lengths of iron rods are added, by connecting them together, as *a b* are in *fig.* 34. The necessity of frequently withdrawing the rods from the holes, in order to collect the mud, stones, or rubbish, and the great friction produced by the rubbing of the tools against its sides, as well as the lengths of rods augmenting in the progress of the operation, sometimes to the extent of several hundred feet, render it extremely inconvenient, if not impossible, to raise them by hand. A tripedal standard is, therefore, generally constructed by three scaffolding poles tied together, over the hole, as shown *fig.* 27, from the centre of which a wheel and axle, or pair of pully blocks is suspended, for the purpose of hauling up the rods, and from which hangs the fork, *fig.* 35. This fork is to be brought down under the shoulder, near the top of each rod, and made fast to it by passing a pin through two little holes in the claws. The rods are thus drawn up, about seven feet at a time, which is the usual distance between each joint, and at every haul a fork, *fig.* 36, is laid horizontally over the hole, with the shoulders of the lower rod resting between its claws, by which means the rods are prevented from sinking down into the hole again, while the upper length is unscrewed and removed. In attaching and detaching these lengths of rod, a wrench, *fig.* 37, is employed, by which they are turned round, and the screws forced up to their firm bearing.

The boring is sometimes performed for the first sixty or a hundred feet, by a chisel of 2½ inches wide, and cleared out by a gouge of 2¼ diameter, and then the hole is widened by a tool, such as is shown at *fig.* 38. This is merely a chisel, as *fig.* 29, four inches wide, but with a guide, *a*, put on at its lower part, for the purpose of keeping it in a perpendicular direction; the lower part is not intended to peck, but to pass down the hole previously made, while the sides of the chisel operate in enlarging the hole to four inches. The process, however, is generally performed at one operation, by a chisel of four inches wide, as *fig.* 29, and a gouge of three inches and three quarters, as *fig.* 30.

It is obvious, that placing and displacing the lengths of rod, which is done every time that the auger is required to be introduced or withdrawn, must, of itself, be extremely troublesome, independent of the labour of boring; but yet the operation proceeds, when no unpropitious circumstances attend it, with a facility almost incredible. Sometimes, however, rocks intercept the way, which require great labour to penetrate; but this is always effected by pecking, which slowly pulverises the stone. The most unpleasant circumstance attendant upon this business is the occasional breaking of a rod into the hole, which sometimes creates a delay of many days, and an incalculable labour in drawing up the lower portion.

When the water is obtained in such quantities and of such quality as may be required, the hole is dressed or finished by passing down it a diamond chisel, funnel mouthed, with a triangular bit in its centre, this makes the sides smooth previous to putting in the pipe. This chisel is attached to rods, and to the handle, as before described; and, in its descent, the workmen continually walk round, by which the hole is made smooth and cylindrical. In the progress of the boring, frequent veins of water are passed through; but, as these are small streams, and perhaps impregnated with mineral substances, the operation is carried on until an aperture is made into a main spring, which will flow up to the surface of the earth. This must, of course, depend upon the level of its source, which, if in a neighbouring hill, will frequently cause the water to rise up, and produce a continued fountain. But if the altitude of the distant spring happens to be below the level of the surface of the ground where the boring is effected, it sometimes happens that a well of considerable capacity is obliged to be dug down to that level, in order to form a reservoir, into which the water may flow, and whence it must be raised by a pump; while, in the former instance, a perpetual fountain may be obtained. Hence, it will always be a matter of doubt, in level countries, whether water can be procured, which would flow near to or over the surface; if this cannot be effected, the process of boring will be of little or no advantage, except as an experiment to ascertain the fact.

In order to keep the strata pure, and uncontaminated with mineral springs, the hole is cased, for a considerable depth, with a metallic pipe, about a quarter of an inch smaller than the bore. This is generally made of tin (though sometimes of copper or lead) inconvenient lengths; and, as each length is let down, it is held by a shoulder resting in a fork, while another length is

soldered to it; by which means a continuous pipe is carried through the bore, as far as may be found necessary, to exclude land springs, and to prevent loose earth or sand from falling in, and choking the aperture.

Under the head of "Assay" is a curious illustration of the uncertainties of this operation, in a table of the experiments of European assayists, on some silver sent to them from the Paris Mint. The variation between the several results is as much as 14 per 1000, and in only two instances have they approached within one per mille of the true result. The article on "Beer" contains an account of the plant, and the several implements necessary in a brewery, and a description of the large establishments in London. The present part promises well for the utility of the work, and we shall no doubt be able to avail ourselves of something in the ensuing parts.

The Practice of Making and Repairing Roads; of constructing Footpaths, Fences, and Drains; also, a Method of comparing Roads with reference to the Power of Draught required, &c., &c. By Thomas Hughes, Esq., Civil Engineer. London: John Weale, 1838.

This is a useful, cheap, and practical work on road-making, and well suited to the wants of the engineering student. Mr. Hughes has condensed into a small space the results of his experience; which are, as might be expected, valuable, as he was engaged under the late Mr. Telford on the London and Holyhead road, as well as in several other parts of England and Scotland for many years.

The author endeavours to rouse the attention of the public to the necessity of improving our parish roads, which have for a length of time presented a most complete system of jobbing and mismanagement. The method of appointing the surveyor of the highways, in the country, has long required a change; and until this be effected, it is ridiculous to expect to have good roads. In most parishes, the system has been this; a surveyor is annually appointed, who may be perhaps a farmer, or perhaps a keeper of a chandler's shop. Immediately on his appointment, it is his first object to put into good repair the road leading to his farm, or to pave the footway in front of his shop, as the case may be; very desirable improvements doubtless, and naturally coming first of all under his notice. Nor is this all; his practice of road-making and mending is probably as rude, as his choice of spots to show his skill upon is arbitrary. It is ten to one that he will cart his gravel from the pits, and shoot it down at once upon the road, without any previous preparation of filling up the ruts and making a solid substratum. Such is the usual character of the parish surveyor; and if by chance a man is for once appointed who knows and cares to perform his duty, just as he begins to bring the roads into a tolerably good state, his term of office expires, and there steps into his place a successor of the usual character before described to derange and stultify all his proceedings. The result is, a state of the parish roads, well described in the following extract:—

The farmer, in conveying his corn and other produce to market, and in sending manure to his fields, may comfort himself with the reflection, that whilst his horses are on the turnpike-road they will not be injured by the loads they have to draw; but what is their situation until they reach the turnpike-road, and after they leave it? Of course, where the turnpike lies in such a direction as not to be available, the case will be worse than where it can be partially used. But even in the most favourable case, it is evident, that the farmer must be content with a much less load than his horses could draw on the turnpike-road, unless he attempt to carry more than a fair load on the bad roads to be passed over, leading into or out of the turnpike-road. On the other hand, if he puts on a fair load for the turnpike-road, his horses will be much overloaded when they come on the inferior kind of road; because a horse, which on the former is able to draw a ton weight with ease, would probably on the latter be unable to move with more than five or six hundred weight. The injurious effects of this are too obvious to require comment: and they establish a strong reason why all roads should be reduced, as nearly as possible, to an equality in point of draught. It could hardly be expected, nor is it necessary, that the same breadth and finish should be given to all roads, which are very properly adopted on the main lines of turnpike; but I am decidedly of opinion, that all roads ought to be equally hard and solid; and I would make every parish and every occupation or farm-road throughout this country, as excellent in this essential point as the great Holyhead road itself. For roads where no great traffic exists, the breadth is of little consequence; but on this kind of road the vehicles which do pass over it are usually farm waggons, containing as heavy weights as any on the turnpike-roads. The unfrequented routes should therefore be as capable of carrying heavy traffic as the great roads themselves; and this they can only be when formed with a firm unyielding foundation. * * Surveyors should be made to act on a fixed system, because the country has already sufficiently suffered from the ignorance and incapacity by which too many of this class are distinguished. Written instructions in the form of specifications should be drawn out by competent engineers, practically experienced in the construction and management of roads; and to these instructions, which should be adapted to particular districts of country, the surveyors should be bound strictly to adhere.

Not only do we concur in these recommendations, but we are even inclined to go further. For we do not expect that any good will be effected, till the whole race of parish surveyors are discharged, and all the roads of each county placed under the superintendence of an able and efficient engineer, who shall be held responsible for keeping them in good condition. He should have authority to appoint district surveyors to act under him; and to employ the poor of each parish on their own roads when it appears desirable. And all the highways should be repaired at the expense of the county, from the county rates.

Mr. Hughes has given in his second chapter some very useful directions for *improving an existing road*. We are not however favourable to giving so great a convexity to roads, as he here recommends.

As a first step to improve the condition of an old road, the direction and general levels of which cannot be altered, I should proceed to cut down high fences, if these exist, on each side of the road, and regularly to trim the hedges, so that the height of the bank and fence should not exceed four or five feet above the level of the road. The soft mud should then be scraped from the surface, and the bed of the road formed with a regular convexity of one inch in five feet, which will give in a road of thirty feet wide, a rise of nine inches in the centre. * * A very common opinion is, that the depth of material in the centre of the road should be greater than at the sides; but or my part, I have never been able to discover why the sides of the road should be at all inferior to the middle in hardness and solidity. On the contrary, it would be a great improvement in general travelling, if carriages could be made to adhere more strictly to the rule of keeping the proper side of the road; and the reasonable inducement to this practice is obviously to make the sides equally hard and solid with the centre. * * If equal labour and materials be expended on the whole breadth of the road, it is evident that the wear and tear will be far more uniform; and when any one part requires repair, the traffic may with safety be turned on to another part. Hence I should always lay on the same depth of material all over the road; and this alone will of course render it necessary to curve the bed of the road. * * The circle, with the circumference of which I would recommend that both the bed of the road and its upper surface should coincide, would be formed with a radius of 150 feet; and as a guide for the workman in making the proper section, it would be very useful to place in his hands a piece of board, having one of its edges curved to the proper figure, and this edge being applied to the road surface, will at once determine the correct degree of curvature.

Chapter IV. describes the various methods adopted for securing a good foundation for the *Highgate Archway Road*. Previously to Mr. Telford taking the superintendence, this road baffled all attempts of its constructors, principally owing to the want of a proper system of drainage, which is the most essential point to be attended to where roads are made through cuttings or on hill sides. Various kinds of foundations for the road were tried; in some parts, gravel or Thames ballast was mixed with cement, and moulded into the form of bricks; in others, the cement and ballast were mixed and spread over the road without moulding. But neither of these modes is considered by Mr. Hughes so good as a foundation formed of concrete composed of Thames ballast and lime.

With the view of affording a modern example in which lime concrete has been used, I would refer to the Brixton road, where a concrete composed of gravel and lime has been recently applied by Mr. Charles Penfold, surveyor to the trust. In this case the proportion of *gravel to lime is that of four to one*. The lime is obtained from Merstham or Dorking, and before being used is thoroughly ground to powder. The concrete is made on the surface of the road, and great care taken, when the water is added, that every particle of the lime is properly slaked and saturated. The bed of concrete having been spread to the depth of six inches over the half breadth of the road, the surface is then covered over with six inches of good hard gravel or broken stone, and this depth is laid on in two courses of three inches at a time, the first course being frequently laid on a few hours after the concrete has been placed in the road. The carriages, however, are not on any account allowed to pass over it, until the concrete has become sufficiently hard and solid to carry the traffic, without suffering the road material to sink and be pressed into the body of the concrete. On the other hand, the covering of gravel is always laid on before the concrete has become quite hard, in order to admit of a more perfect binding and junction between the two beds, than would take place if the concrete were suffered to become hard before laying on the first covering. The beneficial effect arising from the practice of laying on the gravel exactly at the proper time is, that the lower stones, pressed by their own weight and by those above them, sink partially into the concrete, and thus remain fixed in a matrix, from which they could not easily be dislodged. The lower pebbles being thus fixed, and their rolling motion consequently prevented, an immediate tendency to bind is communicated to the rest of the material—a fact which must be evident, if we consider that the state called binding, or rather that produced by the *binding*, is nothing more than the solidity arising from the complete fixing and wedging of every part of the covering, so that the pebbles no longer possess the power of moving about and rubbing against each other. It is found that, in a very few days after the first layer has been run upon, the other or top covering may be applied, and shortly afterwards the concrete and the whole

body of road material becomes perfectly solid from top to bottom. The contrast thus presented to the length of time and trouble required to effect the binding of road materials, where the whole mass is laid on loose, is alone a very strong recommendation in favour of the concrete.

The experiment of using concrete on the Brixton road, although not at present on a very extensive scale, has been tried under circumstances very far from favourable, and on a part of the road which had hitherto baffled every attempt to make it solid. Since the concrete has been laid down, however, there is not a firmer piece of road in the whole trust; and from the success of this and other trials made by Mr. Penfold, but which I have not seen, I believe it is his intention to recommend it in a general and extensive way to several trusts under whom he acts.

* * I would here however suggest, that the surveyor (or whoever may have charge of a road so constructed) ought never to admit of the covering being worn down, so as to permit the concrete to be acted upon or in any manner disturbed; but as soon as the upper surface is worn down to within two inches, or at most to within one inch of the concrete, a new covering the same thickness as before should be immediately laid on.

It may not be considered very foreign to this subject to remark, that in gentlemen's parks, gardens, and pleasure grounds, it is exceedingly difficult, if not impracticable, to make ornamental carriage roads or private walks by the old system of laying on loose gravel or broken stones; for whatever pains be taken in selecting the best kind of gravel, and afterwards in forming and rolling, worms will find their way through and destroy it by depositing a portion of adhesive earth wherever they work to the surface; and these deposits are so numerous, particularly in the autumn, and through the winter and spring of the year, that in the case of the carriage-roads, this earthy material first adheres to the rims of the wheels, and then again sticking to the gravel, tears up the whole surface to the entire destruction of the road. Garden walks from this cause frequently cannot be traversed with any pleasure—the dirt adheres to the feet, and is so exceedingly unpleasant, that such roads and walks, instead of having a hard, clean, and smooth surface, become dirty and unsightly in the extreme. I would recommend in such places, that the roads and paths should uniformly be made with a concrete bottom of only a very few inches in thickness; say three inches for carriage-roads, and two inches for paths, and with a slight covering of binding gravel on the top. This system, I think, would effectually prevent the roads from being destroyed in the manner I have described; for independent of the antipathy which the worm, and, I may add, every description of insect, entertains against lime, and notwithstanding their capabilities of boring, they never could penetrate half an inch into the concrete. As an instance of the perseverance of worms, and the mischiefs they sometimes occasion, I have myself, during a very dry hot summer, met with them in canal excavations, four feet below the surface, in hard clay; and I haveknown them penetrate afterwards out of this depth, and through three feet of clay puddle, thereby actually occasioning leakage in the canal.

The next chapter, *On the Drainage of Roads*, contains many judicious directions; and the following one, chapter VII., gives a variety of formulæ and tables for ascertaining the comparative *effects of different inclinations.*

The concluding chapter, *On the Method of Estimating the Prices of Earth-work, &c.*, will be found useful by the student, as giving various calculations and prices of labour in excavating different kinds of earth, and an example of an estimate for the formation of a road.

The History and Description of the London and Birmingham Railway. Part II. By Thomas Roscoe, assisted in the Historical Information by Peter Lecount, Esq., F.R.A.S. (Civil Engineer). London: Charles Tilt. Birmingham: Wrightson and Webb.

This second part is fully equal to the first, which we noticed in a former number (No. 10). It contains four highly-executed engravings; the first, a view from the hill above Box Moor Station towards Berkhampstead; the second, the Wolverton Viaduct; the third, Denbigh Hall Bridge, which is deserving of notice for its peculiar and elegant construction; the fourth is a beautiful view of Coventry. The letterpress possesses considerable interest. It very properly animadverts on the extortionate demands made on the company for compensation, and the disgraceful difficulties thrown in their way in obtaining the Act of Parliament.

Yes, reader, in every half-yearly report of expenditure sent forth to the twenty-five thousand proprietors, foremost in the items is recorded the appalling fact, that public-spirited men, who are willing to risk millions of their money, and lay out of part of it for seven or eight years, in order to complete such a splendid undertaking as the London and Birmingham Railway, must, before they can obtain permission to commence this work, submit to place down upon their records as the first item of their outlay—"Payments for obtaining the Act of Incorporation, 72,868*l.* 18s. 10d."

The description of the work on the line will be found particularly interesting to our professional readers: it gives a brief account of the construction and cost of the railway, commencing at the Euston Square terminus.

From Euston Square to Camden Town the railway is formed by a wide cutting or trench, about eighteen or twenty feet deep, the sides of which are composed of beautifully executed brickwork, having an iron balustrade at top, which, when the trees and shrubs of the adjoining gardens have sprung up, will form a pleasing object. The land being on a considerable rise outwards from London is worked, as before named, by endless ropes passing over pulleys in the middle of the tracks, which ropes are set in motion by the stationary steam-engines at Camden Town. Great precaution is required in attaching the carriages to the rope; and this is generally done by one man, who is trained for that purpose. The way in which he effects the fastening is by means of a small rope, called a *messenger*, having a slip knot at one end, which he passes over the rope, and holds the other in his hand as he stands on the foremost carriage, in order to release the train when it reaches Camden Town, or in case of accident. By a signal given to the engineer, the engines are stopped in an instant. The train is generally drawn up this length of railway in three or four minutes, during which time the passenger passes under several very handsome stone and iron bridges and galleries; the most extensive are those under the Hampstead Road and Park Street. The whole of this length is excavated from the London clay; and the walls which form the sides are curved, in order to resist the inward pressure; they are as much as three bricks thick at the top, and seven at the bottom; the number of bricks used in forming these gigantic walls was about sixteen millions. When the train arrives at the iron bridge which carries the line over the Regent's Canal, the carriages are detached from the rope, and allowed to run along the line till they meet the locomotive engine by which it is afterwards propelled. * *

Rapidly traversing the Grand Excavation, we soon reach the Camden Town Station, and have in view the open country, and the green and diversified hill of Highgate. In travelling thus far we have passed under seven bridges, two of considerable magnitude,—one being 484, and the other 380, feet in length. The elegant suspension bridge which is slung over the Regent's Canal cost 4,500*l.*; it is divided in the middle by one of the main girders to which the railway is suspended.

The Camden Town Depôt forms a station for the carrying department of goods, while that at Euston Square is set apart for passengers. The former contains thirty-three acres of land, which are raised several feet above the regular surface of the ground, and supported by a wall; so that heavy goods may be easily lowered from the railway waggons into carts, to be conveyed to their destination. At this station is a very extensive locomotive engine-house, which cost 21,000*l.*; several ovens for making coke for the use of the engines; a repository for cattle brought by the railway to supply the London market; stabling for fifty horses; a manufactory for carriages; and offices for a large establishment of clerks, and of the engineer in chief and the resident engineer. Here, also, are the stationary engines for working the ropes, but they are under ground, immediately below the railway; their situation is marked by two very elegant chimneys, which belong to the boilers; these rise to an height of 133 feet above the rails, and are twelve feet diameter at bottom and six at the top.

The ingenious contrivance adopted for communicating from the terminus at Euston Square with the engine-house at Camden Town, a distance of about a mile, is deserving of notice. We believe the first telegraph of this description, if it may be so called, was introduced at the tunnel on the Liverpool and Manchester Railway.

In the engine-house is an organ-pipe or whistle, which communicates with the passenger station at Euston Square by a tube, along which a signal can be conveyed to the engineer in four seconds. The way in which the signal is now given to start the engines, is by an apparatus similar to a gasometer; it consists of a weighted cylinder, which dips into another cylinder filled with water. On allowing the upper or inner cylinder to descend, the air which it contains is forced down an upright pipe in the inside of it, and passes along a pipe under ground; then, as it rushes out at its other end through the whistle, the signal is given to start the engines.

The Book of the Grand Junction Railway. Part 2. By Thomas Roscoe, Esq., assisted by the resident Engineers of the Line. London: Orr and Co.

This work may be considered as forming a continuation of "The History and Description of the London and Birmingham Railway;" it is got up with the same good taste and judgment. The present number is far better than the first, and possesses much more interesting information connected with the railway; it briefly describes the construction of the works, and such objects on the line as may be worthy of notice by the traveller.

A Dictionary of the Ancient Architecture of Great Britain. By John Britton, F.S.A. In one large volume, royal 8vo. London: Longman and Co. 1838.

The name of John Britton has been for so many years honourably associated with architecture, and his contributions to its literature have been so much more extensive than those of any other man, that the profession looks to any work that he may issue with more than ordinary attention and respect. This has, of course, been the case with the Dictionary before us, which was issued in parts, and has been for some time in the hands of the public, the first part having been published in 1830. In such a

length of time the public have had it in their power to form their own judgment, and our task is necessarily restricted.

Compilation in any department of literature or science requires the greatest care and discrimination, and in the formation of a Dictionary more, perhaps, than in any other branch. When such a work is connected with an art or science, abounding with technical terms, derived from classic or foreign languages, it imposes a greater responsibility on the author; particularly in architecture, where there are few defined standards, but many individual masters employing their own forms of expression. The writer who undertakes such a work must enter into deep researches, examine every architectural author, and trace out every existing word which is not common to the English language, while considerable judgment is necessarily required to ascertain what is necessary from that which is superfluous. We need not wonder if, in Mr. Britton's case, this has required some time; and the public will see that he has, to the best of his ability, fulfilled the task.

There are many omissions which occur to us, such as the terms *arcs doubleaux, bird's beak moulding, fan-groining, hipped roof, raking cornice, stump tracery, terracotta,* &c. The first term is indispensable, as we have no English word equivalent to it, and it is adopted by all our writers to express one of the peculiarities of the Italian style. Among the foreign synonymes some startling errors have crept in, which on a future occasion may be avoided; as *rechentisch*, given as the German for abacus; *pilaster*, from *pila*, Latin; and *astro*, Italian, indicating an inferiority! Such defects are, unfortunately, not uncommon among dictionary makers, and the patriarch lexicographer himself was not exempt. In the first edition of Johnson's Dictionary, cotton, mahogany, and a number of terms are not to be found, while there is abundance of most cacophonious Latin barbarisms. Not to mention perversions of meaning, among other pieces of learned ignorance the doctor informs his readers that *mainsheet*, instead of signifying a rope, means the great sail of a ship.

The Dictionary contains some useful information, and so far the profession is indebted to Mr. Britton for his additional labours on a subject to which he had already contributed so much. The nature of the work necessarily involved much archæological research, and the author has, perhaps, done wisely in catering for the antiquarian as well as the architectural student. The plates, exhibiting specimens of various details of the different ancient styles, are engraved with considerable care and beauty, and no exertion as to expense seems to have been spared to render the work worthy of the public.

Mr. Britton returns to his old favourite subject of denominating the mediæval styles Christian architecture, although we may observe, by-the-by, that the term of Gothic is not so inappropriate, the northern invaders of Europe being all derived from a Gothic stock. Some of his engravings present beautiful arrangements of foliage not to be excelled by any school, and fully redeeming the taste and genius of the middle ages.

We should very much like to see a more complete general Dictionary of Architecture and Engineering, undertaken by two or three persons jointly, the Gothic, Grecian, and Roman forming, perhaps, separate departments, and the engineering portion being executed by some one more especially versed in that branch, and acquainted with its technical terms. Such a work is much wanted, and we have no doubt that, if undertaken with spirit, it would well repay the authors for their trouble.

A Practical Treatise on the Construction of Stoves, and other Horticultural Buildings, and on the Principles of Heat as applied to Hothouses, Conservatories, and other Horticultural Erections. By J. W. Thompson, Nurseryman, &c. 8vo., with Wood Engravings. London: Groombridge.

We feel always gratified when we receive any contribution to architecture from the departments accessory to it, as it is by such subdivision of labour that the science must benefit. This work is by a practical man, and being upon a subject with which he has been long intimate, it may naturally be believed that it possesses considerable interest. In it Mr. Thompson points out the advantages of wood over cast iron for horticultural purposes, and then considers the points necessary for the construction of a conservatory; he gives a variety of designs, among which is one by Sir Charles Cockerell, erected at the Grange, in Hampshire, for Lord Ashburton, which possesses considerable novelty and elegance, and is a marked deviation from the old and common place designs.

With regard to some observations in this work, in which Mr. Thompson seems to deprecate the employment of architects, and wishes to make them the tools of gardeners, we should remind him that such a course would prove particularly disadvantageous to the interests he advocates. Independently of the consideration that floriculture is just as much a matter of taste, and as little a matter of money-making, as any other kind of ornament, we certainly think that to a nobleman a great attraction of a conservatory is derived from its architectural effect; for we do not imagine that for the mere contemplation of fruit or flowers any man of taste would load his grounds with barrack-like greenhouses of a nurseryman's garden. In the instance which we have given we think that much of the merit of the conservatory is owing to the taste displayed by Sir Charles Cockerell, and which without the advantages of colour produces a most picturesque effect. We think the noblest property of flowers is that exquisite lesson of divine beauty which they inculcate, and we should prefer the moral effects of such a display to all the pride of a victorious apricot or a prize dahlia. It is very natural however that Mr. Thompson should have a preference for leather, and we are sure that he will excuse us in vindicating the connexion of his own with the other liberal arts.

In the subsequent part of his work Mr. Thompson describes his egg-shaped boilers, to which it is unnecessary for us to refer, as we are previously indebted to him for his communication on this subject in one of our former numbers.

This work is highly useful and interesting, and acquires additional claims to attention, at a period when botanic gardens are making such progress in all parts of this country; and as Mr. Thompson remarks, it cannot fail to be necessary to architects engaged in such works to make themselves acquainted with the practical details of their construction.

ORIGINAL PAPERS, COMMUNICATIONS, &c.

RALPH REDIVIVUS, No. 10.

THE ADELPHI.

That this range of houses would have a profusion of the most laudatory epithets bestowed upon it, were it ever to find its way into one of George Robins's advertisements, may be taken for granted as a matter of course; but that it should ever have been seriously styled "a most magnificent pile of building," is almost incredible. At the same time, its having been so characterized furnishes a proof that words are sometimes put together without the slightest meaning. Magnificence may be defined to be grandeur accompanied with sumptuousness or richness, which latter, be it observed, are not essential to grandeur, for an edifice may be grand from its magnitude and relative proportions, although of decoration it may possess very little.

The Adelphi, however, possesses merely largeness, unaccompanied by magnitude of forms and proportions, and is equally devoid of richness. It is true there is some embellishment, or what is intended to be such, applied to it, yet with so little feeling, or even skill, as to occasion only an offensive disparity between the ornament and the thing attempted to be ornamented. Leaving alone for the present the taste of the decoration itself, it is evidently misapplied, because bestowed on what, so far from being at all adapted to receive it, is homely even to bareness and baldness. We behold a range of common-sized houses, whose windows are mere holes in the walls, and which have nothing whatever to distinguish them from those in nearly all the streets at the west end of the town, save that the two centre houses, and that at each end, have pilasters stuck up against them, for the purpose of giving to the whole range the appearance of a single continuous façade. At the same time everything contradicts such idea, and counteracts such impression: the numerous small doors, squeezed-up areas, crowded windows, all hinder us from fancying for more than a moment that we behold a single large structure—one neither divided into separate dwellings nor cut up into small rooms. The same remark applies to the so-called '*Terraces*' in the Regent's Park, and those on the Bayswater Road, some of which would be far more appropriately characterized by the name of barracks, to which latter, though not intended to do so, they bear a much stronger resemblance than to palaces. At the best they look like no more than one side of a street of tall houses, turned out for an airing; for they are stretched out so indefinitely that, as masses of building, they are less imposing in their general aspect than the Adelphi, which Cumberland has styled—

> ———"The fraternal pile on Thames' banks
> That draws its title, not its taste from Greece."

Robert Adam was certainly a man of some talent, and modern domestic architecture is indebted to him for not a few improvements which he introduced; but, unfortunately, he was not gifted with the most refined or delicate taste; not but that there are many exceed-

ingly tasteful ideas to be met with in his designs, but then they seldom occur except as mere random hits; even the best of his works presenting many gross blemishes mixed up with its beauties. He seems never to have bestowed any revision on his designs, but to have adopted them at once, for better and worse, with all their imperfections on their head. If he was in many respects an architectural fop, he certainly was also an architectural sloven; and of both his foppery and slovenliness in architecture, the building here noticed affords incontestible proof. Its embellishment is so finical as to appear ridiculously outrè—almost intended as a satirical caricature. It is a barrack tricked out and dressed up after the fashion of a boudoir; the consequence of which is, that, affecting to be eminently fine and refined in style, it is eminently vulgar, rendered paltry by mal-à-propos embellishment.

Wherever windows predominate, as they certainly do here, the first study of the architect should be to render them expressive in the design, and either to adopt or to adapt his style accordingly. Instead of which, Adam thought he might as well spare himself that over-refinement of thought and trouble, by making his windows mere holes in the wall, and patching on some *genteel* decoration beween them, so that no one should say either that economy had not been consulted, or that taste was altogether omitted. And it must be admitted that the taste here displayed was peregrine enough. Another would probably have contented himself with merely adding plain pilasters and entablature to his row of houses, whereas Adam seems to have fancied that would be making homeliness more homely: his taste scorned the idea of common slices of pilaster. He accordingly determined to astonish the public by a specimen of the richness of his ideas in decoration, panelling his pilasters and filling them up with a showy pattern, which he took care to extend likewise to his entablature, making amends for such extravagance by omitting the architrave, and reducing the cornice to little more than a moderate sized moulding. The town was in ecstasies of astonishment: it shouted out superb! magnificent! and now, alas! nobody thinks it worth while to turn down from the Strand even to take a peep at Adam's magnificent pile; or if any one does, he returns filled with astonishment of a very different kind—surprise that such a paltry gingerbread piece of architecture should ever have been admired, for now-a-days many of the gin-palaces about town exhibit quite as much grandeur, and far more consistency of design.

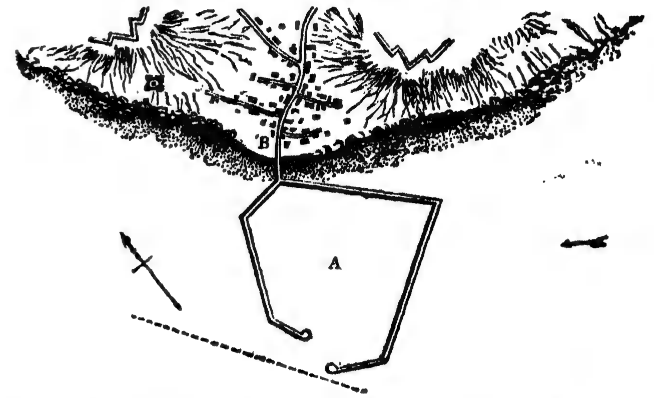
After all, in spite of the Adelphi, and some other flagrant enormities, Robert Adam was, as I have said, a man of some ability and cleverness, but exceedingly unequal, often very happy, in particular parts, and very seldom indeed, if ever, satisfactory upon the whole. So far from being at all scrupulous as to innovation, he was ambitious of striking out a new style; but he mistook the reverse of one error for a distinct merit; whence, in endeavouring to emancipate himself from the formal heaviness of his predecessors, he fell into a meagre flimsiness and flutter, and was apt to bestow a great deal of finical ornament upon buildings which were architecturally of the utmost plainness: consequently there generally prevails a marked antipathy between the embellishment and the thing it is applied to, which suit with each other about as well as a Quaker's prim drab bonnet, and Parisian artificial flowers.

Neither is this false taste entirely to be ascribed to his studies of Diocletian's Palace at Spalatro, for impure as both the composition and details of many of its parts were, in many there was rather an excess than any deficiency of architectural details, elaborately wrought entablatures and doorcases, indicating a totally different gusto from that which led the architect of the Adelphi to put a narrow horizontal stripe upon his pilasters, to leave his windows mere holes in the wall, and to make his doors hardly less insignificant. Even much of his ornament is itself in very bad architectural taste, and seems to have been derived from the patterns of paper-hangings, it frequently consisting of sprigs and leaves looped up with shreds of ribbons; so that instead of being rich, it looks hard and dry. The panels of the pilasters of the Adelphi have the appearance of having been stamped with a butter print.

For grandeur or beauty Adam had no soul: nearly everything he did bore the mark of littleness and pettiness, frequently of prettiness also; therefore, where prettiness alone was required he succeeded. He was, withal, a great mannerist: like the Adelphi, the house at Kenwood is quite in the *twelfth-cake style*—patched all over with panels of filagree work, so that one might be excused for imagining that it had been erected by some retired pastry-cook, in order to enjoy his *ocean-full of dignity*—as a late worthy Baronet ventured to translate the words *otium cum dignitate*.

At the rate I am going on it will be said that I shall pluck Robert Adam's reputation absolutely bare, nor leave him even a single feather of any kind; passing over, therefore, all the manifold architectural vices and sins with which he is justly chargeable, I freely own that in some cases they are counterbalanced by the excellence of his plans. His forte lay in interior arrangement, and in both the distribution and the forms of rooms. Herein, as in some other respects, he was the Soane of his day. The large circular saloon designed for Sion House is strikingly beautiful in plan, fraught with piquant complexity, yet without confusion. Had he, therefore, done nothing meritorious, except breaking through the monotonous system of making houses only nests of square boxes, we could almost forgive such a mawkish piece of architecture as the Adelphi.

HARBOURS OF REFUGE.



Plan of WILLIAM TAIT, ESQ., C.E., *for forming Isolated Harbours.*

Harbour engineering is of all departments that which is more particularly in a barbarous state; there is no acquaintance with general laws, and an especial deficiency of local information. There is hardly one harbour among the many constructed in this country, which has been formed by an attention to fundamental principles; but the moment an engineer is appointed to form a plan for such an undertaking, he goes to work at second hand, and without any regard to locality, endeavours, *mutatis mutandis*, to apply some construction which has been successful in another place. Smeaton has backwater at Ramsgate, and, therefore, other situations must have it also; and there is a pier in a hundred places, and so it would not do to be without that. The consequence is, that where there is a bar it is made worse, and if there be none, one is very soon formed. Meanwhile the unlucky engineer is confounded with his ill-success, and knows not to what to attribute it; he has a better pier than his predecessor, and has made important improvements in the hinges of the lock-gates, while the only end of his vexations is, that the harbour is choked by a south-wester, and the pier goes to the devil in a storm.

While we are making gigantic efforts with regard to canals, docks, and roads (and the progress of the country is perpetually requiring new ports), there is scarcely one of our harbours that has been doctered which is not injured. The effect is most prejudicial to our commercial marine, for it operates on many most important places; in fact, we need only refer to Dover, Yarmouth, Whitehaven, Dublin, and many others, where our best engineers have been baffled, and all their operations disconcerted. This has in most cases been caused by a want of attention to physical laws; but it may likewise have some influence, that in such works, a degree of nautical knowledge is required in the details, which is too often neglected by the engineer.

The evil has become so apparent, that it has excited considerable attention and discussion, which is the true way to elicit the truth. One of the oldest dogmas of harbour engineering is the necessity and utility of backwater, and there is none more fallacious; it is the attempt to obtain this which has caused more errors, and wasted more money, than all the other sources of ignorance put together. The Thames, the Severn, the Shannon, and the Humber, have backwater, and, therefore, engineers have run mad to follow the example. Although a large body of water might force a passage, that is no reason, but the contrary, why a small quantity should be effective. You might put a fire out by a pailful, but it consumes the water if only dropped upon it. Neither is it absolutely true that a great body of water will force a passage, not to mention the Rhine, or the Nile, the Tagus, the Douro, and many other rivers, which are barred by superior force. This absurd doctrine was not doubted, we believe, until lately, as it has been acted upon from Smeaton down to Dover Harbour, until it was combated by Mr. Henry Barrett, in his plan for Lowestoft Harbour, brought before Parliament last year. He affirmed that the cause of bars was, that the stream of backwater fell

upon the tidal current at right angles, and that the bar was formed by deposition at the place of meeting of the matter held in solution. His remedy was that the stream of backwater should be brought into union with the tidal current at as small an angle as possible, so that the united stream might carry off the silt. This principle is of general application to all similar cases, and shows that the farther you carry out your backwater at a wrong angle, the farther you extend your bar.

A principle adopted by Mr. Hyde Clarke is that of clearing out a harbour by bringing the tidal current in to act upon it, instead of relying upon backwater. A survey for a plan of this kind is now being carried on at Dublin, by Mr. F. W. Beaumont, for insulating Howth Head, and clearing away the North Bull Sand.

In Mr. Rooke's work, reviewed in our present number, these theories are confirmed, and a great deal of space is devoted to the consideration of Tynemouth, Whitehaven, Maryport, and many other harbours.

One great difficulty in the way of most harbour designers is the stream of shifting shingle flowing along most of our coast, and ever ready to choke the shingle traps of the fated engineers. Upon this devastating enemy they have exhausted their sluice gates and backwaters for years, and they would doubtless feel happy to ascertain any means of disposing of their antagonist. We feel no less gratified on our part to see any effort made which may introduce something new into the annals of science, and rescue engineering from the routine of piracy and second-hand robbery now too prevalent, and degrading to a profession which ought to be one of genius.

We have been favoured by Mr. Tait with a plan and description for the formation of harbours, which we consider well deserving the attention of our professional readers, both for its originality and ingenuity. In his remarks accompanying the plan he more immediately applies his observations to the Kentish coast, upon which and upon every part of Kent his professional labours give his opinion much weight. These remarks, however, are susceptible of an application much more general. He, in the first place, expresses his complete disapproval of the scouring power, in which, from our remarks on Lieut. Worthington's work on Dover Harbour, he will find that we entirely coincide. After giving Mr. H. R. Palmer's observations on shingle, he proceeds to explain his own plan, although justly remarking that it would be improper to give any specific plan, without first seeing the spot at which it was intended to construct a harbour on any principle. He observes, that when the shingle in its transition has to pass through a narrow gorge, it continues to be borne along and to travel onward, by which case nature herself has pointed out a principle, upon which the shingle may be assisted to pass forward, and its accumulation in any particular spot prevented. The object being, therefore, not to obstruct the shingle in its progress, Mr. Tait suggests an *isolated* harbour; that is, that the harbour shall be built independently of the coast, and united to it by a bridge, under which the shingle may pass; and the mouth of the harbour being in sufficiently deep water, no cause will exist to diminish the depth of water, impede the silt, or stop it up. This is in full support of what we had advanced with regard to Dover Harbour; "whatever is done, no attempt must be made to oppose the progress of the shingle, for that is, in our opinion, impossible."

Mr. Tait remarks, that any extra expense which might be incurred by the nature of such a work, would be more than compensated by its advantages; while its application would render the construction of harbours a matter of facility in any position, however difficult it may hitherto have been considered.

Annexed is an imaginary plan, showing the construction of an isolated harbour on Mr. Tait's principle. A, is the harbour, which is connected with the land by a bridge; B, revetment or sea wall; the arrow indicates the tidal current, and the dotted line the course of the prevailing south-west wind.

ON THE LATEST MEASUREMENTS OF THE PARTHENON.

TRANSLATED FROM THE GERMAN COMMUNICATION OF JOSEPH HOFFER, GOVERNMENT ARCHITECT AT ATHENS, IN THE "ALGEMEINE BAUZEITUNG" OF VIENNA.

The labours of Stuart, Revett, and others, having thrown so much light on the architecture of Athens, it occurred to some residents to go over the works there, and ascertain the correctness of the details given by these authors. This was undertaken by Mr. Hoffer and two of his colleagues, and the results have not been without interest. These investigations have elicited that the Greeks paid the greatest attention to produce perspective effect, even in the minutest details; and that their edifices are by no means so simple in their construction as the measurements hitherto given have caused to be believed.

The measurements were conducted with the greatest care, and by the best instruments that could be made in Bavaria. The first operations were begun in the Parthenon, to ascertain the proportion of the entasis or swelling of the shafts. As they could place no dependence on the plummet, an iron cramp was fastened on the shoulder of the capital, and another on the lowest tambour of the column; between each cramp a silk thread was stretched tightly, and brought so close to the column as to touch the entasis, by which it was seen that the thread stood at an equal distance from the column above and below. By this examination they found that the position of the highest point of the swelling varied in every column. The average of several measurements gave about 5-12ths of the whole length of the column, reckoned from below as the situation of this point.

Besides this they remarked, that the several columns in the direction of the length and breadth of the temple, did not stand perpendicularly to their axes, but that they had an inclination from the middle ones outwards, sideways, and diminishing from the corner columns towards the centre. The reason for this inclination will be communicated subsequently.

By the measurement of the entablature it was farther shown that all lines which have hitherto been received as straight and perpendicular, were not so throughout, but appeared to have been formed with a flat curve towards their versed sine, so that the architrave appears to have sunk on both sides. At first it was conjectured that this might have been caused by some disturbance, but subsequent examination showed that all the constructive lines, from the lowest step to the cyma, followed this curve, and that all the vertical joints were in such perfect preservation that the stones seemed almost melted together. The south and north sides of the temple were found conformable to the eastern, which was the first examined. In order still farther to confirm these observations, the Temple of Theseus was similarly examined, and the same circumstances ascertained, and that the inclination from the right line in both cases was in relation to the size of the temple. The rise or versed sine of the curve is about $1\frac{1}{2}$ to 2 inches in the centre of the length of the portico. It seems probable that in this circumstance we may find some clue to the enigma of Vitruvius respecting *Scamillis imparibus*.

Besides this curve of perpendicular lines from above, which to distinguish from the others we shall call convexity, these perpendicular lines have a second curve, namely, inwards towards the temple; the length of the sine is about $1\frac{1}{2}$ inches. This class of lines, like the preceding, are all parallel to each other, and have the same curve. If this curve should also be found in the Temple of Theseus, it will prove how elaborate was the attention devoted by the Greeks to architectural effect.

To return to the inclination of the axes of the columns of which we have already spoken, it seems to clear up an obscure passage of Vitruvius, in which he says, "Only the middle columns are perpendicular, the others being inclined towards the temple." The case occurs exactly here where, on the long side of the temple, there is a great range of columns, only the central ones being perpendicular, the remaining inclining to the corners. On the short sides, where there are less columns, none are perpendicular, but all incline themselves towards the corners. The measurements of a great many columns have been taken for this purpose, and they all agree, and at a future period the Temple of Theseus will be examined for the same object.

With regard to the construction by which these abnormities, if we may so term them, are produced, it appears that these bendings are by no means produced by perfect curves, but that the lines are polygonal, and that each block of an architrave or a step is rectilinear in itself, the effect being produced in the arrangement of the joints. The inclination of the columns is effected by giving an inclination to the upper surface of each tambour, which is continued through every piece.

The walls and antæ of the cella seem to exhibit similar inclinations.

The continuation of the investigations on this subject will serve to throw a clearer light on the case, and enable us to decide how far importance ought to be attached to the previous observations.

ANALYSIS OF SAND STONE.

ON THE CORRECT METHOD OF ASCERTAINING THE RESISTIBILITY OF STONE TO FROST, TRANSLATED FROM THE GERMAN OF DR. BUEHNER, PROFESSOR IN THE UNIVERSITY OF VIENNA.

The means of ascertaining the capability of resistance of stone against frost occupied the attention of scientific men at an early period; but, although some recent communications have been made on the subject, they are but reproductions of the experiments of the mineralogist Brard. His system, which is that of subjecting stone to the action of Glauber salt, so as to produce a low temperature, has long been adopted as a universal medium in most countries of Europe, and sanctioned by many high authorities. It is truly observed, however, by Professor Fuchs, in Erdmann's Journal, that such a mechanical method is of no more certainty than to rasp the stone with the finger nail, or strike it with a hammer, and that the only competent test is to subject it to chemical analysis.

The builders employed on the royal works at Munich have, in the course of their extensive practice, resorted to this process of analysis in preference to the usual method, and the following is an account of the experiments of M. Stumb, principal builder in that city:—

On the occasion of repairing the weather side of the tower of the Lady Church, at Munich, he instituted an examination into the sandstone of Waakirchen, in the district of Wiesbach. This sandstone is of a bluish grey colour, equal and fine grain, noways splintery, of moderate hardness, and giving sparks when struck with steel. On a closer inspection, minute specks of mica and quartz may be perceived.

A piece of this stone, weighing 80½ ounces, was laid in distilled water for

24 hours, and on being taken out and weighed, it was found to have increased 6 grains, hardly two per cent, and affording a good proof of its closeness of formation, and small power of absorption.

The water in which the stone had been laid was evaporated to an ounce, and a yellowish residuum obtained, which, on being subjected to reagents, was found to consist of sulphate of lime and sulphate of soda, mixed with organic matter.

A piece of the sandstone was pulverised, and 100 grains of it treated with muriatic acid, and a partial dissolution effected by the development of carbonic acid gas. The remaining acid having been renewed by evaporation, the residuum of quartz sand was washed and cleaned with warm water, and found to weigh 57 grains.

The muriatic residuum was subjected to nitrate of ammonia, whereby alumina was produced, with a portion of oxide of iron. It weighed, on careful trial, 3½ grains.

The solution filtered from the aluminous precipitate was treated with oxalic ammonia to produce deposition of the lime, which was exposed to the fire to convert the oxalate of lime into carbonic acid gas, and by which 24 grains of carbonate of lime was produced. The fluid filtered from this was acted upon by phosphate of natron, and a precipitate of phosphate of ammonia and magnesia appeared, which by heat was reduced to neutral phosphate of magnesia, which was calculated as 13 per cent. of carbonate of magnesia.

The composition of the stone was, consequently,

Quartz	57
Alumina	3·5
Carbonate of lime	24
Carbonate of magnesia	13
Loss	2·5
	100

From these results it was proved that the sandstone of Waakirchen was a good building material, and fully capable of resisting the effects of air and water, as its component parts were not liable to decomposition, and its texture did not admit the introduction of their mechanical force.

It is evident that it is only by such trials that the true qualities of materials are to be ascertained, as mere mechanical action, or a trial of temperature, affords no criterion of the chemical constitution by which injuries of weather are caused.

ZANTH'S DRAWINGS.

Some architectural drawings were exhibited at the rooms of the Institute of British Architects, on Monday, the 17th ultimo, which although very limited indeed as to number, must have afforded very high gratification to those who beheld them, being of superlative interest as to subjects, and of superlative excellence as to execution. We have seen many able and carefully executed drawings of this kind, that have charmed us by their accuracy and their taste; we have seen many also that have captivated us, by their masterly effect and bravura, by their breadth and play of light and shade;—in fact, we thought we had seen the ne plus ultra of water-colour painting as applied to architectural subjects. Accordingly we went with the expectation of beholding some good subjects respectably treated. Great then was our astonishment, greater our delight, when after looking at some of the smaller drawings on the table, that seemed to corroborate our preconceptions, we turned to the interior of the church of the Convent Olivella, at Palermo. It is a perfect gem—a chef d'œuvre of the most finished beauty, finished up in every part most surprisingly, elaborated with diligence incredible, yet in such a manner as to produce a magical effect of nature; a most powerful and brilliant yet clear and quiet effect, combined with extraordinary vigour and depth of colour, yet at the same time entirely free from all exaggeration, and from all those conventional artifices of shadowing which are almost invariably resorted to; for all the parts and figures in *demi-jour* are in perfect daylight, though quite in shadow compared with the rest. This is the case with the whole of the foreground, and yet the priests in their magnificent robes, the carved stalls, the statues, the superb mosaic pavement—every object and all its details are expressed with a verity truly astonishing. The local colouring is preserved in all its nuances, so that when you examine any one part, it appears a finished picture in itself; and yet with regard to the rest it does not appear at all obtrusive, the keeping of the whole composition being truly admirable. To say nothing of the skill shown in it, the labour alone demanded by such a subject must have been quite formidable; for there is an infinitude of detail, and the utmost variety of material, variegated marbles, bronze, gilding, frescos, inlaid pavements, &c.; nevertheless, as if all this exuberance and prodigality of forms and colours did not afford exercise enough for his pencil in one drawing, M. Zanth has introduced numerous figures in the foreground, so admirably touched, that Turner's dots, specks, and blotches, crossed our imagination at the moment, and we blushed for English art. Nay, we question whether, if placed by the side of this fascinating drawing, the very best subjects of the same class, by any of our English water-colourists, would not appear either very tame and spiritless, or else exceedingly rough and sketchy, not to say slobbered.

Besides the above there were two other interiors of the same size, viz., that of the Cathedral at Monreale, and of the Chapel Royal, Palermo; two splendid architectural scenes, arrayed in all the pomp of gold and mosaics in the roof and upper part of the walls. For description we have no room, nor will we bore and tantalize the reader by our ecstasies, and therefore throw down our pen at once, after saying that though we wish no harm to M. Zanth, we do hope that he will not be permitted to carry back those three drawings with him out of this country.

NEW SYNAGOGUE, GREAT ST. HELEN'S.

This building, erected from the designs of Mr. J. Davies, which is approached through a passage at the rear of Crosby Square, was consecrated on the 14th ultimo. The exterior has not very much the appearance of belonging to a place of worship, for it consists of a small loggia, formed by three open arches resting upon coupled columns, with an upper floor above it, having five arched windows, the end ones being over those which occupy the parts below that enclose the loggia. The centre portion, which is crowned by a bold block cornice, advances a little before the rest of the front, which has plainer windows, and a door in each of the compartments so formed. Within the loggia are three doors, that open into a narrow vestibule or corridor, running transversely to the body of the building, at the end of which are staircases leading to the galleries for females, and to the committee-room, occupying the upper floor of the centre of the front. Facing the doors from the loggia are others which open immediately into the interior of the synagogue. The effect, on first entering, is very striking, owing not only to the splendour of the sanctuary at the other end, but also the spaciousness, lightness, and elegance of the ensemble; for instead of the floor being occupied with pewing, which in all our churches encumbers the lower part, and gives it a mean and huddled up appearance, the sittings below hardly extend beyond the pillars that support the galleries, and instead of being enclosed have merely a dwarf parapet before them. The reading-desk, or whatever may be its peculiar name, is a spacious platform enclosed by a low parapet, upon whose pedestals stand massive candelabra of gilt metal. There are similar ornaments within the sanctuary; besides which, gilt lamps are suspended from the fronts of the galleries. These have an upper order of Corinthian columns, making five intercolumns on each side; corresponding with which are as many windows of ground glass; and one peculiarity belonging to these windows is, that they have dressings and cornices, which certainly gives a very great degree of architectural finish to the design. In other respects, however, there is little decoration, if we except the gilded metal foliage and scrolls, intended to serve the purpose of *grilles;* for, though forming apparently an open-work parapet to the galleries, they are raised upon the real parapet, which is the Doric entablature of the lower order. Here every part of the architecture itself is of a uniform white tint, the display of colours being reserved entirely for the sanctuary or ark, a spacious semicircular recess, adorned with two orders—the lower a Doric, in pilasters painted in imitation of verde antique, on a porphyry ground; the upper Corinthian, in pillars and pilasters, in imitation of Sienna marble, with three windows in the intercolumns, of a rich arabesque pattern, in stained glass. The ceiling is a semidome with octagonal coffers, containing gilded flowers on an azure ground: and the pavement, which is of polished marble, forms an entire circle, one half of it projecting so as to form two steps leading up to the sanctuary. In addition to this richness of colours, there is much decoration in the way of gilding, both on the entablatures and the capitals of the columns; the latter, however, are not gilt *en masse*, but merely tipped with gold on the mouldings and foliage. Had some gilding and colouring been extended, although in a very subdued degree, to the windows and other parts of the side elevations, the general effect would, in our opinion, have been much improved. The dimensions of the interior are 72 feet by 54, or 32 between the galleries, and 45 high.

ON THE CONSTRUCTION OF SKEW ARCHES.

Sir,—Having read the article on the construction of skew arches, in which C. L. O. has attempted to lay down the most simple method of setting out arches of that description, and to point out the errors into which he conceives Mr. Fox has fallen in his essay on that subject—both which he has most decidedly failed to do—I should feel obliged if you would allow the following remarks to occupy a portion of your valuable journal, hoping that C. L. O. may be induced thereby to reconsider his remarks, and correct the errors that a tyro has taken the liberty to point out, and finally succeed in "rendering the subject of sufficient simplicity to suit the most ordinary capacity."

He commences with such a misconception of the essay in question, that one can scarcely believe he has ever read it with attention. He says, "Mr. Fox states, in the first place, that a skew arch is really a square threaded screw wound round a cylinder, and with this position in view he proceeds to explain the mode of constructing the arch, all of which is unfortunately wrong." Mr. Fox no where says that it is, nor anything like it; he has evidently had too much practical experience, and is too good a geometrician to commit such a blunder. C. L. O. is unfortunately wrong in making such a statement. Mr. F. does not commence his essay with a lengthened definition of a skew arch,—whether it is formed by winding a straight or a spiral line round a cylinder,—whether the section be waved always at right angles to the axis, and the angle formed by the thread itself continually changing as it recedes from the centre,—or whether the face be level at right angles to the axis only at the key stone, and always forming the same angle with the axis of the cylinder when viewed from above; but proceeds at once to show the most "simple mode of setting out and working the *courses* of stones in a skew arch, so as to bring in the thrust in a proper direction;" and it is a course of these stones, not the arch itself, that he speaks of as being in the form of a "spiral quadrilateral solid wrapped round a cylinder, or, in plainer language,

the principal of a square threaded screw;" a fact that half an hour's study will discover to any one.

But C. L. O. having committed one error, necessarily falls into another (for it is evident that he has all the way considered Mr. Fox to be speaking of the face of the arch, when he has been speaking of the beds of the courses); he says, after having referred to his diagrams, &c.—"from this statement it will be apparent that the intermediate development of which Mr. Fox speaks is quite unnecessary," &c. If he will examine his model, for it is presumed he has one, or recollect what he has said in reference to the thread of a screw, "that the angle which the thread itself forms with the axis is continually changing as the parts of the thread becomes more remote from the centre," or turn to Mr. Fox's diagrams, he will immediately see that the joints of the beds *cannot* be at right angles to the approximate line both at the extrados and intrados; hence the value and importance of the intermediate development, that the arch may exert all its force in a true direction.

He next proceeds to remark on the problem Mr. Fox has introduced for ascertaining the twist of the beds, which he says, however simple it may appear to himself, is not certainly very intelligible to a working mason. If the operation is not so easily comprehended as could be desired, it unquestionably produces a correct result, which it strikes the writer cannot be obtained by C. L. O.'s method, thus described (page 280):—"Let figure 4 represent the front of a skew arch, the front of the key stone, the dotted soffit of which is shown at D, figure 3, is here indicated by the shaded surface, and the back of the same stone is shown by the dotted outline beside it. The distance from P to G, figure 4, is the difference between the distance of the front and back of the stones from the centre, or highest part of the arch. If two lines be drawn through these points, as nearly as possible at right angles to the curvature of the arch, the angle formed by their intersection will be the actual wind of the stones."

Now it is obvious, that if the soffit be equally divided, and all the stones on the face of the arch drawn as nearly as possible at right angles to the curvature of the arch as he directs, that the stones at the base, having a centre (as he tells in page 313) higher up the arch, must be thicker at the extrados, or back, than those at the crown, where that part of the curve is described by a longer radius, and approaches nearer to a straight line than that part of the curve at the base (described by a shorter radius); and any one can see that the nearer the curve approaches to a straight line, the more distant from that line will be the point of intersection, and the nearer will the sides of the stone approach to parallelism; consequently the angle of the twist (obtained as directed) will vary in every course, and the operation must be repeated accordingly, and the "working mason," instead of having to solve one problem, will probably have to work a hundred; indeed this method appears to me to involve an insurmountable difficulty, because the angle of the twist must be continually changing in each individual course as it proceeds from the base on one side, or face of the arch, across towards the crown on the opposite side.

It seems not a little strange, after having corrected the error (page 313) which C. L. O. says he committed in consequence of having inadvertently followed Mr. Fox's essay, that he should so strongly recommend Mr. Fox's method of working the stones by the straight edges and square, which is founded on the very principal that he explodes, viz., that the centre of the cylinder is the axis of the arch, and that all the beds must point to it as Mr. Fox's description of the square and mode of application will prove, one limb of which he says shall be made to the curvature of the soffit, and the other the *radius* of this curve, always taking care that this square is kept at *right angles to the axis*.

Having thrown together these few unscientific, and I almost fear in some points unintelligible remarks, simply for the purpose of eliciting a fuller explanation of those parts which present to my mind so many difficulties, I beg only to observe further, that I have never studied the subject before, or read Mr. Fox's valuable essay (vol. 3, page 251, Architectural Magazine), but that I perfectly comprehend the rules he has laid down, and believe that he has pointed out every thing requisite to enable any one to construct the arch in question without difficulty. If a more simple method *can* be devised, it would certainly be valuable. I hope C. L. O. may be disposed to persevere in the attempt, and ultimately succeed in rendering his rules suitable to the ordinary capacity of A STUDENT.

"ROMAN CEMENT."

REPLY TO H. N.'S OBSERVATIONS.

Sir,—As your correspondent, H. N., charges me with great incorrectness in my remarks upon cement, I may perhaps be allowed to say a few words in vindication of my statements.

That a very great increase has taken place during the last few years in the consumption of Roman cement may easily be accounted for, by the immense increase in building all over the kingdom; but that several other substances have been introduced to the public notice,—many of which have partially superseded the use of Roman cement,—is a fact too well known to every large builder to require any further confirmation.

My opinion of the blue lias lime was derived from my own experience; supported by the testimony of many of our largest metropolitan builders. If your correspondent doubts the truth of my statement, he may easily judge for himself, by inspecting the Charing Cross Hospital, the Blind Asylum, St. George's Fields, the Athenæum Club House, the new buildings in Belgrave-square, &c., all of which are covered with the blue lias lime.

His comparison of the analysis of Atkinson's and Parker's cement only proves the correctness of my statement, that the difference between those two substances was comparatively trivial. Yours, &c.

C. L. O.

BIRMINGHAM RAILWAY TERMINUS.

Sir,—While admiring the noble railway terminus the other day, I was also greatly astonished and vexed at observing the disgusting condition in which it already is in some parts; for if the practices now tolerated be not speedily put a stop to, in a very short time all the base of the structure will be as filthy as the staircases of some of the Roman palaces, and this majestic propylæum will look like an approach to the temple of Cloacina. There can, surely, be no more difficulty in preserving it from such defilement than there is in protecting other public buildings from similar offences. I should conceive even much less, because, as the place is always open, there must always be some one or other attached to the establishment upon the spot.

Nevertheless, the building seems at present quite abandoned to the *discretion* of the neighbourhood; for I observed a number of dirty boys amusing themselves by scrambling between the columns and bronzed railing, although the latter was then but just put up. Unless all this be speedily put a stop to, the railing, the columns, and every part within reach will be greatly injured, in appearance at least. The bronzing of the gates will be rubbed off, perhaps the columns themselves scrawled and scribbled upon; and then people will probably complain of what ought never to have been suffered to occur.

Is there not a single porter—not one policeman in attendance? Some steps should be taken to prevent the shameful nuisances now permitted. Therefore, unless they have in the interval been adopted, I trust that this letter will have the effect of calling the attention either of the architect or some other individual interested in the building, to the abominations here complained of. CIVIS.

FRICTION WHEEL CARRIAGES.

Sir,—In No. IX. of your journal, I observe a description, accompanied by a drawing, of "Coles's Patent Friction Wheel Carriage." The Patentee states that "my invention" is "novel and important;" he denominates the carriages as "my Friction Wheel Carriages."

In a work entitled "Mechanics or the Doctrine of Motion," by W. Emerson, you will find an account of "Wheel Carriages:" to which he adds the following:—"To make the friction as little as possible, some have applied friction wheels;" and then proceeds to describe them with a plate and references.

That your correspondent cannot claim the invention as his own, is evident, for others have applied friction wheels; neither is it a "novel invention," as the date of "Emerson's Mechanics" is A.D. 1769; nor is it an important invention, or it would by this time have been generally adopted.

W. L. B.

[Our correspondent appears to have in some degree misapprehended Mr. Coles's expression. We think he applies the epithets "novel and important" plainly to "another part of my invention;" viz., the "elastic spring buffer" &c., which he goes on to describe.—Ed.]

ARCHITECTURAL SOCIETY.

Sir,—In your notice of the endeavour made to unite the Architectural Society with the Institute of British Architects, and of the meeting at which the Society determined it not to be desirable to form a junction with the Institute upon the terms contained in the scheme, you proceed to state that, "on the same evening, Messrs. Walker, Ferry, Moore, Wright, Bury, Lee Parish, Woodthorpe, Brandon, and Flower, ceased to be members; Messrs. Johnston and Watson have since withdrawn;" and that "the Architectural Society, thus deprived of its chief members, we fear may be considered as so much crippled in its usefulness, as to be virtually dissolved."

As one who has the honour of being a constant visitor to the public meetings of the Architectural Society, and intimately acquainted with several of those gentlemen who so laudably *established* that institution, permit me to correct your statement with regard to its being deprived of its chief members by the secession of those gentlemen you have named.

Without venturing an opinion whether your fears that "the Architectural Society, thus deprived of its chief members, may be considered as so much crippled in its usefulness as to be virtually dissolved," it is sufficient to inform you, that those gentlemen who have ever taken its interests into their consideration, and supported it by their exertions, abilities, and funds, and who have proved their determination to maintain at least the dignity and privileges of *every member* of their society, still compose the Architectural Society, to which I am sure you, with myself, wish every possible support and success; for whilst pursuing its course in unassuming modesty, it is laying the foundation of a new era, when the practice of architecture will be entrusted to *those alone* whose qualifications are based upon probationary study, under a professor, and authenticated proof of *personal talent in design* and knowledge of the sciences connected with their profession.

Yours, &c.,

T. SQUARE.

ANTI-OXYDATION OF METALS.

In one of our recent numbers we drew the attention of our readers to the important invention of Dr. Wall, for the prevention of corrosion of copper and other metals; we have now the satisfaction to state, that the experiments upon copper sheeting, as also upon the iron water tanks used in the naval service of the country, have been eminently successful, and fully test the value and national importance of the process adopted by the ingenious inventor.

SUGGESTIONS FOR AN IMPROVED METHOD OF LAYING A LINE OF RAILWAY.

It appears to be established among engineers, that continuous longitudinal timber bearings are far preferable to isolated stone blocks for laying the rails on, the motion of the trains being much easier, the road kept in repair at a much cheaper rate, and the damage to the engines and carriages considerably less; in addition to which, there is a considerable saving in the first outlay. It has been stated by some of our most experienced engineers, that a certain degree of *elasticity* is necessary for perfection in the upper works of a railway; and it further appears, that on the Great Western Railway, where the longitudinal sleepers have been laid on transoms and piles, that a harshness or percussion has been experienced by the carriages at the points where they are connected, which may be wholly attributed to the unyielding and non-elastic nature of the connecting points. Indeed, according to published reports and documents, the longitudinal sleepers on the Great Western and other lines of railway, where this method has been adopted, are in future to be retained in their places by ballasting only. But it appears there is also an objection to this, which is the difficulty of getting a firm and uniform bearing whereon to lay the timber, which having scarcely any weight in itself (in comparison with what passes over it), lies loose on the surface, subject to continual disarrangement. What I am about to propose may or may not remedy the evil; it is simply this—firmly to bed stone blocks at certain intervals, but larger and of a rougher kind than those used for fixing the chains to in the present method of laying the rails. On these blocks I would lay timber of a larger scantling than usually employed for longitudinal sleepers, and which I would firmly attach to the stone blocks, either by treenails, or bolts and plates passing quite through the stone blocks and timber sleepers. I cannot say at what intervals 'twould be advisable to lay th se stone blocks, but if at any considerable distance, packing to a limited extent might be adopted between the blocks; but if laid within a few feet ofe each other, I do not conceive that any additional support than that furnished by the stone blocks would be necessary, and from the stiffness of the scantling a light rail screwed or spiked down, may be used without sensible deflection being produced, however great the weight rolling over it. I should not suppose that this method would involve much greater expense than the present system of stone blocks, as a much lighter rail would suffice, chains would be dispensed with, and if packing was not necessary, the timber from its under surface not being bedded in the ground would be kept drier, and consequently more free from decay.

PETER BRUFF.

Charlotte-street, Bloomsbury.

[By reference to our first number, fig. 9, page 1, it will be found that the Americans have a similar method of laying their rails. We are inclined to believe that isolated supporters, whether it be by way of piles or stone sleepers, would be equally objectionable; they are both intended for the same purpose, to *support* the longitudinal sleepers, or they are of no service, and in our opinion, both would produce the same effect on the locomotive engines and the rails.—Ed. C. E. and A. Journal.]

PUBLIC BUILDING AT RUGBY.

(From a Correspondent.)

In July last an advertisement appeared in the public papers, inviting architects to send in designs for the above object, to comprise Town Hall, magistrates'-room, news-room, library, museum, and other accommodations, for which a premium of twenty guineas was offered. The cost of the building was not to exceed 2,500*l.*, and only three weeks were allowed to prepare the drawings. The premium offered seemed very inadequate, and the time too limited; however, many architects were induced to prepare designs, as the subject was by no means a complex one, and the premium was a gift from Mr. Wratislaw, the solicitor, who, with a public spirit which does him great credit, was anxious to elicit a design which might be creditable to the town. Sixty-four designs were sent in by respectable architects from all parts of the country, and exhibited at Mr. Wratislaw's house, on the 25th of August, when that by Mr. Eginton, of Worcester, was selected. A list of the competitors, and a polite letter of thanks, were sent to the several architects with their drawings, which had been forwarded to Rugby, and also returned to their authors free of expense. We are thus minute in these particulars, as one of the gentlemen, who submitted designs, received an anonymous letter, per post, from Manchester the other day, reproaching him for having entered the lists as a competitor, and couched in terms of the most filthy and coarsest description.

If the preceding statement should reach the eye of the anonymous writer, he will there see how mistaken he is in his facts, and will learn, perhaps, to blush at his disgraceful conduct, upon knowing that every reasonable assurance was held out, that the successful candidate, if an architect of well known reputation and respectability of character, would, doubtless, be employed to carry his design into execution.

Wooden Pavements.—The experiment of wooden pavements seems to have been fairly tried in Philadelphia. The success which has attended the efforts in Walnut Street and Chesnut Street is conclusive of the adaptation of that pavement in city streets. Of the duration, positive and comparative, of wooden pavements, it is of course impossible yet to speak, but it may be said that in several streets of the city stone pavements have exhibited strong evidences of needing repair in less time than the wooden pavement in use.—*Philadelphia Courier and Inquirer.*

BLOWING UP OF THE BOYNE.

Considerable curiosity was excited in Portsmouth to witness Mr. Abbinet's experiment of blowing up the wreck of the Boyne, off Southsea Castle, which was burnt and sunk in 1795. This wreck has ever since been a disgrace to the naval energies of this country, affording as it did an obstruction to all coasters and vessels of light draught of water. When Abbinet first made an effort to remove it parts of it were only four feet under water; at this moment there is not less than 18 feet over every part at low water, and therefore great good has been done to the navigation of Spithead and the port purely by dint of private exertion. About four years ago Mr. Abbinet, with a magazine of 200lb. of powder, blew off about 30 feet of the sternmost part of the wreck; and it was only in the spring of this year that he brought into harbour a mass of timber weighing at least 30 tons, a portion of the result of that explosion. We mention the time of this first experiment to show that Colonel Pasley's late experiments in the River Thames were by no means original ones. On the present occasion 630lb. of powder were exploded, and this was enclosed in an oil hogshead, into which two stop cocks were inserted; to these were attached two leaden tube pipes, containing an igniting match of 45 feet in length; at the upper end of each portfires were attached, which would burn about four minutes. When the pipes were attached, the magazine was very gently lowered into the water, and as it sank it was hauled into the situation intended by means of a rope leading through a block, previously lashed to or near the kelson of the wreck. The part fixed on was under the larboard bilge, abreast the main chains, with at least 20 feet of the bottom overhanging; the ship was lying on the opposite bilge. At this place about 30 feet of the bottom aft was entire, this is now destroyed or laid flat, as well also as the bottom for 40 feet forward. The whole wreck now therefore is dispersed on the ground, the fore part having been destroyed in the original burning; and as the tides, which run pretty strong over the spot, will no doubt soon wash off the mud which has accumulated to some feet in depth, Mr. Abbinet will be able to pick up the various portions, the most valuable of which are copper bolts and copper sheathing. The guns have been already nearly all picked up. When the magazine was safely landed, the two portfires, with the upper ends of the lead tubes projecting upwards about two feet, were securely lashed to an 18-gallon cask as a float; all boats and vessels were now ordered to withdraw, and Abbinet having fired the matches, withdrew himself. On the explosion taking place, a huge mass of water, about 40 feet square, rose up in a solid bulk for about six feet high, and then broke in the centre, throwing up several foamy columns for about ten feet higher. A low report was heard, as of a heavy explosion at a great distance, but no flame was apparent, nor was there any smoke; we imagine, however, if it had been dark, that a flame would have been seen to issue from the water. The day was beautifully fine; nearly 100 boats, filled with parties, were assembled; and it was quite amusing to witness the subsequent scrambling for fishes which were stunned or stupified, and to the number of hundreds came up floating on the water. The Port-Admiral, Sir Philip Durham, was present, and as the experiment was intended to have taken place on the preceding day, it would have been a singular incident that he should then have been present at the blowing up of one ship, as flag-officer of the port, on the 56th anniversary of the sinking of his own ship, the Royal George, near the same spot, at a time when he was junior lieutenant of her.—*Hampshire Telegraph*, Sept., 1838.

PREPARED FUEL.

In the course of the successive days of last week, a series of trials have taken place at Woolwich Dockyard, the principal establishment for her Majesty's steamers, under the superintendence of Messrs. Kingston and Dinnen, the former being the oldest engineer in her Majesty's navy, whose experience therefore for this important object induced the government authorities to place the testing of the invention under his immediate inspection. The grand desideratum for sea-going steam vessels, is considered to be the concentration of inflammable matter in as small a compass as possible; both on account of economy and of the stowage of munitions of war and provisions. The invention under trial is termed "prepared fuel," and is a composition of "screened" (otherwise almost uselessly small) coal, river mud, and tar, cast into blocks of the same size and shape as common bricks. An engine was worked with this "prepared fuel" on Tuesday; the consumption for six hours forty-five minutes, was seven hundred and fifty pounds. On Wednesday, the same engine was employed for the same period of time; and it required eleven hundred and sixty-five pounds of "north country coals" to keep it going: showing a saving of four hundred and fifteen pounds in favour of the "prepared fuel." On Thursday "Welsh coal" was used, and one thousand and forty-six pounds were consumed; and on Friday, "Pontop" coals being supplied to the engine, one thousand and ninety-eight pounds were required to work the engine for the six hours and forty-five minutes. On Saturday, six hundred and eighty pounds of the "prepared fuel" easily performed the same work; thus showing a reduction of expenditure of four hundred and eighteen pounds in favour of the invention. It is also highly necessary to point out that, on the average of the consecutive days, it required about fifty pounds less of the "prepared fuel" to "get steam up," which was not only better maintained by very little "feeding," but more readily obtained by the inflammable nature of the material. The "prepared fuel" will, no doubt, be generally adopted throughout the service; as, in addition to its excellency of quality for the purpose designed, it has the advantage of being "stowed away" in a compact state, and is not liable to act as a shifting ballast.—*Shipping Gazette*, *August* 8.

ABSORBED AND EFFECTIVE POWER OF LOCOMOTIVE ENGINES.

(From the Irish Railway Report.)

One of the first points to be considered in reference to the mechanical advantages of railway communication in comparison with canals and the usual road traffic, is the amount of power which must necessarily be expended before any force of traction can be communicated to the load. This expenditure, or absorption of power, far exceeds what would, in the first view of the question, appear at all probable. Few persons, perhaps, are aware, that the power absorbed in the largest of the engines at present employed on the Liverpool and Manchester line, in order to put the engine, &c., in a condition to move, and independently of any power applied to the motion of the load itself, amounts to about one-third of the whole power expended; yet such is the case, and it will be seen, therefore, how essential it is to the success of any railway undertaking, with locomotive power, that a very great amount of goods and passengers should be conveyed, and these not in small detached portions, but in large masses.

In fact a large and abundant traffic is essentially necessary to the success of any railway, undertaken as a matter of profitable speculation to its subscribers; and although there are certainly cases, where a line is opening the resources of a country, in which a less amount of present revenue may be held sufficient, yet it is proper that a full and satisfactory illustration should be given of the great proportional increase of charge per ton per mile, which would necessarily be incurred in the case of a deficient or inconsiderable traffic.

As part of the above statement may appear extraordinary, and as we believe that the subject has not been hitherto generally comprehended, it will be proper to point out the sources to which this absorption of power may be traced. These are:—

1st. The friction of the engine gear, independently of any load.

2nd. The friction of the wheels, axles, &c., of the locomotive itself.

3rd. The friction of the wheels, axles, &c., of the tender.

4th. The constant resisting pressure of the atmosphere to the motion of the pistons: all which retardations must necessarily be overcome before any remaining force can be made applicable to the traction of the load.

We have not thought it advisable to introduce the numerical computations on this head into the body of the report, but by referring to the note below, it will be seen that we may assume in general very nearly one-third of the whole steam power employed, as absorbed in what may be termed "preparing to move a load," and this is the same for great or for small loads; the consequence is, as shown in the note referred to, that the relative expenditure of steam power per ton per mile is nearly six times greater for a load of ten tons, than for one of 100 tons, and so on in different proportions for other defective loads. The same relative increased expenditure is incurred for wages to the engineer, stoker, and other persons engaged in conducting the loads. The expense of wear and tear of the engine bears at least the same ratio, not to mention all the fixed expenses of direction, stations, gatekeepers, road-attendants, &c., which will obviously be increased in a still higher proportion.

The question here, however, is merely the relative cost of working with different loads, which is reduced to a tabulated form, in the note above quoted.

NOTE.

The amount of the three former resistances above referred to, depend in some measure upon the perfection of workmanship, and have been found to differ in different engines; but from the best information we have been able to collect, and upon which we conceive reliance may be placed, these several retarding forces may be taken at a medium as below, viz.:—

First, The friction of the engine gear, independently of any load, is equivalent to 6lbs. per ton for the weight of the engine applied at the circumference of the wheel.

That is, supposing the engine to be raised from the ground, and a power applied to the circumference of the wheel, it would require an amount of force of 6lb. per ton to cause the wheels to work the piston and engine gear, both sides of the piston being open to the atmosphere; therefore, conversely, when the pistons work the wheels, this same amount of steam power must be expended to put the gear in motion.

Secondly, The friction and resistance of the locomotive itself, independently of the engine gear, is 8lbs. per ton applied to the circumference of the wheel.

That is, the engine gear being detached from the wheel, it will require a force of traction of 8lbs. per ton to balance the resistance due to the friction of the axles, and to the retardation on the line of way.

Thirdly, The friction of the tender itself, including the increase of friction brought on the engine gear, is 9lbs. per ton of its own weight.

Fourthly, The last resistance, *i. e.*, the atmospheric pressure on the piston, is necessarily 14.7lbs. per square inch, or 11½lbs. per circular inch on the area of both pistons. But this force being employed at the extremity of the piston rod, and being overcome only with the velocity of the piston, must be reduced according to the relative ratio of the velocities of the wheel and piston, which is different in different engines.* (See Pambour on Locomotive Engines.)

Before we can, therefore, exhibit numerically the amount of this retardation, it is necessary to state the dimensions of the several engines, which, after six years' experience, the directors of the Liverpool and Manchester [illegible] other railway companies, have found it expedient to adopt.

These are as below:—

Classes.	Cylinders, Diam. of.	Piston, Stroke of.	Wheel, Diam. of.	Engine, Weight of Tons.	Tender, Weight of. Tons.
1	14 inches	16 inches	4 feet 6 inches.	12	6
2	12 „	16 „	5 „ 0 „	12	6
3	11 „	18 „	5 „ 0 „	8½	5½
4	11 „	16 „	5 „ 0 „	8½	5½

In all these engines the pressure exhibited by the safety valve is 50lbs. per square inch, and, therefore, the actual elastic power of the steam in the boiler is 50lbs. added to 14.7lbs. or 64.7lbs. per square inch.

With these data the amount of absorbed power in these several cases is easily computed.

First Class—Friction of Engine gear	- -	6 × 12 = 72lbs.
Do. Locomotive	- -	8 × 12 = 96 „
Do. Tender	- -	9 × 6 = 54 „
		222lbs.
Area of both pistons, 307.8 square inches, at 14.7lbs. per square inch. Reduced in the inverse proportion of the double stroke of the piston to the circumference of driving wheel, gives	- - - - - - -	853 „
Absorbed power	- -	1,075lbs.

Now, on a good road, and with a well-made carriage, 1lb. is generally estimated to draw 30lbs. The power thus absorbed, therefore, in what may be termed the *preparation for motion*, with the first class locomotives, is sufficient to draw 32,250lbs.; viz., more than fourteen tons on a good road by horse power. And again, on a canal with the usual barges, 1lb. will draw, at 2½ miles per hour, 400lbs. of useful load, viz., independently of the weight of the barges; this absorbed power would, therefore, draw 430,000lbs., which is more than 190 tons.

In a similar manner, the amount of absorbed power in the three other classes is found as below:—

Second Class—Friction of Engine gear	- - - -	72lbs.
Do. Locomotive	- - - -	96 „
Do. Tender	- - - -	54 „
Atmospheric pressure on 226.2 inches, at 14.7lbs. reduced in the ration 5.9 to 1	-	564 „
Absorbed power	- -	786lbs.
Third Class—Friction of Engine gear	- - - -	51 lbs.
Do. Locomotive	- - - -	68 „
Do. Tender	- - - -	49½ „
Atmospheric pressure on 190.06 inches reduced in in the ratio of 5.23 to 1	-	533½ „
Absorbed power	- -	702lbs.
Fourth Class—Friction of Engine gear	- - - -	51 lbs.
Do. Locomotive	- - - -	68 „
Do. Tender	- - - -	49½ „
Atmospheric pressure on 190.06 inches at 14.7 per inch, reduced as 5.9 to 1	-	471½ „
Absorbed power	- -	640lbs.

Now the whole power of these several engines is found by multiplying the area of their respective pistons by the pressure (64.7lbs.), and then reducing this product to the circumference of the wheel.

In this way it will be found that the

	Class 1st.	Class 2nd.	Class 3rd.	Class 4th.
Whole power is -	3,755	2,488	2,337	2,090
Absorbed power -	1,075	786	702	640

It thus appears that the absorbed power is nearly one-third of the whole power of the engine.

This absorption necessarily takes place, whether the whole power of the engine be required or not; and hence again is seen the advantage of large loads, that the engines may always have their full duty to perform.

Having found the whole amount of engine power, and the amount of absorbed power, it is easy to find the extreme load the engine is capable of drawing, the data for this determination being as follows:—

The mean force necessary to overcome the friction of the best constructed carriages and waggons on a level line amounts to 8lbs. per ton of the gross

* This ratio is that of the double stroke of the piston to the circumference of the driving wheels. It is a well known principle in mechanics, that when a force is transferred from one part of a system to another, the product of the pressure into the velocity is constant.

The product of the pressure of the piston into the velocity of the piston is equal to the product of the resulting pressure to the axle into the velocity of the axle, which is to the former velocity as the circumference of the wheel to the double stroke of the piston.

load (that is, of the weight of the load and carriages inclusive,) and 1lb. per ton additional of the said gross load, for the extra friction brought on the engine gear; in all 9lbs. per ton.

Hence, therefore,

		1st Class Engine.	2nd Class.	3rd Class.	4th Class.
Whole power	-	3,755	2,488	2,337	2,090
Absorbed power	-	1,075	786	702	640
		9) 2,680	9) 1,702	9) 1,635	9) 1,440
		297 tons.	189 tons.	182 tons.	160 tons.

There is, however, another limit to the power of an engine, viz.—the adhesion between the wheels and the rails. The amount of which, according to a set of experiments on frictions by George Rennie, Esq., and published in the Philosophical Transactions for 1827, is about $\frac{10}{67}$ths of the pressing weight: so that assuming the weight on the driving wheels to be 6 tons, the greatest power of adhesion is 2,000lbs., and the greatest load about 222 tons; such loads, however, are seldom applied except as a mere matter of experiment.

Now, theoretically, the most advantageous load, as a matter of economy, would be the greatest practical load the engine is capable of drawing, supposing the plane to be every where horizontal; but as the engines and trains generally have to ascend planes which require great additional force of traction, the load seldom amounts to so much as half the greatest load the engine is capable of drawing on a level; but taking every thing into account, it is still most economical to take the greatest load that, under all circumstances, is practicable.

In the following, Table 1, column 2, there is given the amount of steam pressure requisite for different loads, from 10 tons to 290 tons, which is formed by simply adding to the absorbed power 9lbs. per ton, and it thus appears that in the first class engine

A load of 10 tons requires - - 1,075 + 90 = 1,165lbs.
A load of 100 tons requires - - 1,075 + 900 = 1,975 "

That is, ten times the load is drawn by considerably less than double the power: as the loads increase in weight towards 100 tons, which is assumed as the ordinary load, the unfavourable comparison in respect to the amount of fuel diminishes, and beyond that load the expenditure is less than in the medium case.

In order to exhibit the relation in this respect, in all practicable cases, the proportional amount of power per ton per mile, or for any distance, is computed and given in the fourth column of Table 1. The numbers are found thus:—the power required for 100 tons is 1,975lbs. or 19.75lbs. per ton, and for 10 tons 1,165 or 116.5lbs. per ton, then denoting the former by unity—

$$19.75 \ : \ 116.5 \ : : \ 1 \ : \ 5.89$$

That is, the quantity of power per ton per mile with 10 tons, is very nearly six times as great as with 100 tons. In the same way all the other numbers in the fourth column are computed.

The third column exhibits the relative velocities attainable with different loads; these numbers are thus obtained. The second column exhibiting the constant piston pressure required, and the power of the engine or the supply of steam being supposed constant, the velocities will be inversely as these pressures; that is, the velocity with which steam can be produced of a power represented by 1,975, is to the velocity with a pressure 1,165, inversely as 1,975 : 1,165, or as $\frac{1}{1975} : \frac{1}{1165}$.

Therefore, calling the former velocity 1, the latter will be 1.70, or 10 tons will be carried with $1.\frac{7}{10}$ times the speed of 100 tons. In a similar way all the numbers in the third column have been obtained.

At present we have only spoken of the excess of expenditure for fuel, but it will be seen that every expense is increased in a greater or less degree with small loads. The time of the engineer and assistants for example, costs as much per hour with small loads as with great loads, and therefore, if the time of the journey were the same, the expense per ton for wages would be ten times as great with 10 tons as with 100 tons, but the time is not the same; the expense per ton per mile, therefore, is directly as the time, and inversely as the load, or inversely as the load and velocity; representing therefore again, the expense per ton for locomotive attendance for 100 tons by unity; the expense per ton for 10 tons is to that for 100, as $\frac{1}{10} \times 1.7$ to $\frac{1}{100} \times 1$, or as 100 to 1.7, or as 5.98 to 1. In this way the several numbers in the fifth colum are computed.

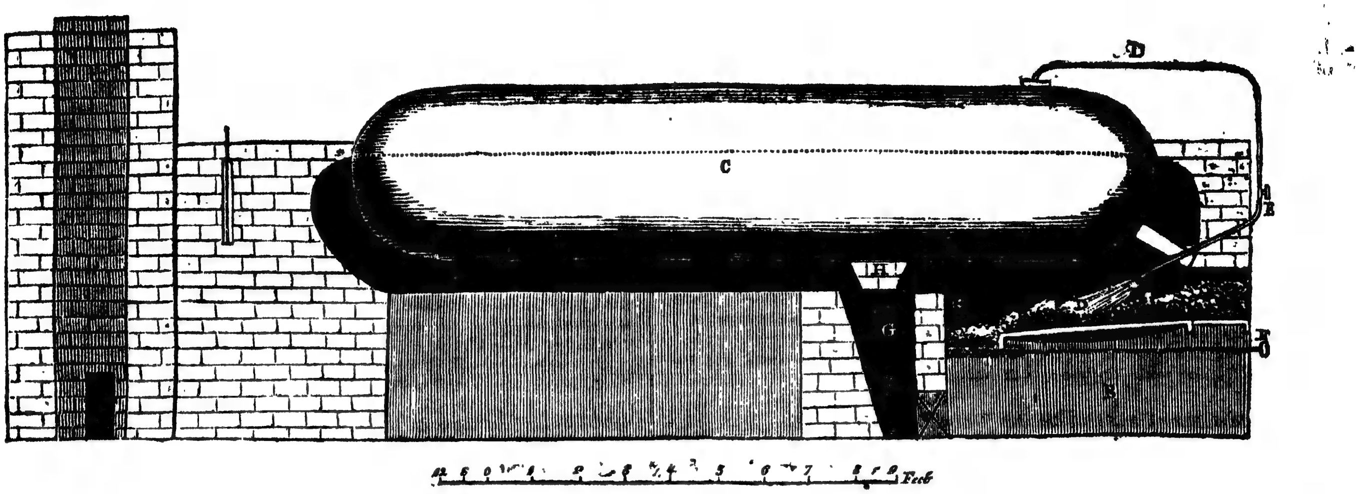
Another important expense attending locomotive power is the wear and tear of the engine, and of the rails, chairs, &c.; but this item is not so easily reduced to numerical results as those considered above. It is not perhaps an unreasonable assumption, that an engine sustains as much or even more injury by passing a certain distance with a load of 10 tons, at the rate of 34 miles per hour, as with the load of 100 tons at the rate of 20 miles per hour, which would make the expense per ton per mile inversely as the load, and, therefore, the wear per ton ten times as great with ten tons as with 100 tons. But if we take only the momentary wear and tear to be constant, we shall have as in the case of wages, the charges for this item per ton per mile, inversely proportional to the load and velocity, and, therefore, expressible by the same number as in the preceding cases: these are given in the sixth column. In a way similar to that which has been described for the formation of Table 1, for engines of the first class; Tables 2, 3, and 4 have been computed for the other class of engines, the only difference being, that in these the medium load is taken at 80 tons in the second and third class engines, and at 60 tons in the fourth instead of 100 tons.

TABLES showing the Steam Pressure required in the Cylinders for different Loads; the relative Velocity with those Loads; and the relative Expense of Haulage per Ton per Mile.

	Amount of Load.	Steam Pressure.	Relative Speed.	Steam power expended per Ton per Mile.	Wages per Ton per Mile.	Cost of Wear and Tear per Ton per Mile.
TABLE 1.—FIRST CLASS ENGINES.	No Load	1075	1.84			
	10 Tons	1165	1.70	5.98	5.98	5.98
	20 "	1255	1.57	3.17	3.17	3.17
	30 "	1345	1.47	2.27	2.27	2.27
	40 "	1435	1.37	1.82	1.82	1.82
	50 "	1525	1.29	1.51	1.54	1.54
	60 "	1615	1.22	1.36	1.36	1.36
	70 "	1705	1.18	1.23	1.28	1.28
	80 "	1795	1.10	1.13	1.13	1.13
	90 "	1885	1.05	1.05	1.05	1.05
	100 "	1975	1.00	1.00	1.00	1.00
	110 "	2065	.95	.95	.95	.95
	120 "	2155	.91	.91	.91	.91
	130 "	2245	.88	.87	.87	.87
	140 "	2335	.84	.84	.84	.84
	150 "	2425	.81	.82	.82	.82
	160 "	2515	.78	.80	.80	.80
	170 "	2605	.75	.77	.77	.77
	180 "	2695	.73	.75	.75	.75
	190 "	2785	.71	.74	.74	.74
	200 "	2875	.69	.72	.72	.72
	210 "	2965	.66	.71	.71	.71
	220 "	3055	.64	.70	.70	.70
	230 "	3145	.62	.69	.69	.69
	240 "	3235	.61	.68	.68	.68
	250 "	3325	.59	.67	.67	.67
	260 "	3415	.58	.66	.66	.66
	270 "	3505	.56	.65	.65	.65
	280 "	3595	.55	.64	.64	.64
	290 "	3685	.54	.64	.64	.64
TABLE 2.—SECOND CLASS ENGINES.	No Load	786	1.91			
	10 Tons	876	1.74	4.60	4.60	4.60
	20 "	966	1.56	3.48	3.48	3.48
	30 "	1056	1.42	1.88	1.88	1.88
	40 "	1146	1.31	1.52	1.52	1.52
	50 "	1236	1.22	1.31	1.31	1.31
	60 "	1326	1.13	1.18	1.18	1.18
	70 "	1416	1.06	1.08	1.08	1.08
	80 "	1506	1.00	1.00	1.00	1.00
	90 "	1596	.94	.94	.94	.94
	100 "	1686	.89	.90	.90	.90
	110 "	1776	.85	.85	.85	.85
	120 "	1866	.81	.82	.82	.82
	130 "	1956	.77	.80	.80	.80
	140 "	2046	.73	.78	.78	.78
	150 "	2136	.70	.76	.76	.76
	160 "	2226	.67	.74	.74	.74
	170 "	2316	.64	.73	.73	.73
	180 "	2406	.62	.72	.72	.72
TABLE 3.—THIRD CLASS ENGINES.	No Load	702	2.02			
	10 Tons	792	1.79	4.46	4.46	4.46
	20 "	882	1.61	2.48	2.48	2.48
	30 "	972	1.46	1.82	1.82	1.82
	40 "	1062	1.34	1.49	1.49	1.49
	50 "	1152	1.23	1.29	1.29	1.29
	60 "	1242	1.14	1.16	1.16	1.16
	70 "	1332	1.06	1.07	1.07	1.07
	80 "	1422	1.00	1.00	1.00	1.00
	90 "	1512	.94	.95	.95	.95
	100 "	1602	.89	.90	.90	.90
	110 "	1692	.84	.86	86	.86
	120 "	1782	.79	.84	.84	.84
	130 "	1872	.75	.81	.81	.81
	140 "	1962	.72	.79	.79	.79
	150 "	2052	.69	.77	.77	.77
	160 "	2142	.66	.75	75	.75
	170 "	2232	.64	.74	.74	.74
	180 "	2322	.65	.73	.73	.73
TABLE 4.—FOURTH CLASS ENGINES.	No Load	640	1.84			
	10 Tons	730	1.61	3.73	3.73	3.73
	20 "	820	1.44	2.08	2.08	2.08
	30 "	910	1.29	1.55	1.55	1.56
	40 "	1000	1.18	1.27	1.27	1.27
	50 "	1090	1.08	1.11	1.11	1.11
	60 "	1180	1.00	1.00	1.00	1.00
	70 "	1270	.93	.93	.93	.94
	80 "	1360	.87	.86	.86	.86
	90 "	1450	.81	.83	.83	.83
	100 "	1540	.76	.79	.79	.79
	110 "	1630	.72	.76	.76	.76
	120 "	1720	.68	.74	.74	.74
	130 "	1810	.65	.71	.71	.71
	140 "	1900	.62	.69	.69	.69
	150 "	1990	.59	.68	.68	.68
	160 "	2080	.56	.67	.67	.67
	170 "	2170	.54	.65	.65	.65
	180 "	2260	.52	.64	.64	.64

ECONOMY OF FUEL AND PREVENTION OF SMOKE.

(Extracted from the Mining Journal.)



The process consists merely of the admission into the furnace of steam in small quantities, through a tube D, taken from the boiler, and discharged over the fuel A, at any expedient place. The best and easiest mode appears to us to be by the introduction of the pipe conveying the steam immediately above the door of the furnace, with a fan-shaped termination reaching beyond the dumb-plate, and perforated with minute apertures, so as to throw the steam in small jets down upon and over the fire. One effect produced is the absolute prevention of smoke; another, the operation of the fire is fully doubled, and the steam employed itself consumed. The bridge of the furnace should, however, be raised rather higher than usual; and a little behind the bridge, another, in the form of an inverted arch, should be placed, so that, in meeting the current of the flame, it may direct it downwards, by which a large portion of the ashes and refuse of the fire is precipitated. The employment of steam, we need hardly observe, greatly increases the draught of the chimney.

The following is a brief statement of the trial to which the process was subjected in our presence, being taken from a copy of rough notes made on the occasion:—

On Monday, the 27th August, in the presence of the patentees, Dr. Fyfe, and other scientific gentlemen, we attended at the Castle Silk Mills, to witness the application of the process.

To enable our readers to accompany us in this experiment, we must inform them that the factory where the patent is applied is a building of hewn stone, which, from its magnitude and design, may vie with any similar structure in the kingdom. Its object is the spinning of silk from the "waste," as it is termed, or what, in mining language, would be called the "halvans," or "attle." The machinery, which is peculiarly beautiful, is worked by steam power, and to a portion is applied a ten-horse high-pressure engine. The nuisance created by its smoke in the vicinage, and the erection of two additional engines, each of seventy-horse power, directed the attention of Mr. Ivison, the manager, to the best means of consuming the smoke, and its necessary sequence, a saving of fuel. How successfully, will be better appreciated by giving our readers a recital of what we ourselves witnessed, and, moreover, renders any praise of the skill and ingenuity of the inventor (Mr. Ivison) superfluous.

The steam in the boiler being at a working temperature, we examined the state of the fire on commencing the experiment. The cistern from which the boiler is supplied was filled, and 392lbs. of coal weighed to the stoker. At half-past two o'clock the engine went to her work, and as the cistern required additional water, from the evaporation going on, it was measured in; the whole quantity taken during the experiment, of five hours' duration, being 504 gallons, or 5,040lbs. At half-past eight o'clock, the furnace, boiler, and cistern, were re-examined, and found to be in a similar state as when the experiment commenced; the actual consumption during the five hours being, as already stated, 392lbs. of coal, giving a result of 5,040lbs. of water evaporated, or 12.88*lbs. of water evaporated by one pound of coal*; thus proving that an *increase* of steam, *equal to* 115 *per cent.*, had been acquired by the application of the process of simply throwing in a jet of steam upon the fire.

Thus far the proof was adduced of the saving of fuel, and our attention was next directed to the prevention of smoke, although we should observe, that during the experiments no smoke whatever issued from the chimney. Fresh coal was therefore put on the fire, and in the course of a few minutes we had a succession of trials, when the smoke, issuing as on ordinary occasions, ceased almost momentarily on turning on the steam-jet—the interval being about eight *seconds*.

The boiler is worked at a pressure of 35lbs. on the square inch, and the quantity of steam injected into the furnace is calculated at about one-tenth of that generated. We should mention, that the surplusage of water supplied to the boiler is returned by a pipe, communicating with the cistern, so that all the water employed or taken is entirely evaporated, and thus obviates any question which might arise in testing the quantity of steam generated by a given quantity of fuel. We may add, that the coal used was an inferior Scotch coal, and that the boiler and furnace were certainly not in the best order, although the engine was doing her regular work, the experiment having been made for our satisfaction, without unnecessarily interfering with the business of the factory.

This invention will be highly important, from its applicability to locomotive engines, where coal in lieu of coke may be used; and we cannot but think that it may be applied to many domestic purposes. To the maritime interests the saving of tonnage, and the advantages from fewer depots, are too obvious to particularize.

It may not be amiss, in closing our notes on this important discovery, to observe, that the quantity of coal consumed in working the engine for twelve hours would be 940lbs., or 8cwt. 1qr. 16lbs., and which would evaporate 12,096lbs. of water, being an *excess* of 6,456lbs. over the present mode of generating steam—the price delivered being from 5s. to 10s. per ton. The coal used on this occasion was rendered at 5s. per ton, but assuming the average to be 7s. 6d., the cost of working the engine would in such case be about 3s. per day of twelve hours; and when the work performed by machinery, so set in motion, is compared with that which would be accomplished by manual labour, at a like cost, it seems almost incredible, while it affords a striking evidence of the ingenuity and powers of man, and of the advantages attendant their application.

We have received the following communication on the same subject, which will give some additional information:—

To the Editor of the Civil Engineer and Architect's Journal.

Sir,—In accordance with a suggestion by another of your subscribers, given in page 319 of your last publication, I beg to transmit to you an account of the working of the only effectual smoke-burner I have ever seen. Mr. Ivison, of this town, by means of a jet of steam, entirely prevents smoke, and saves fuel to an enormous extent. As I feel interested in the subject, I have taken part in the experiments, which indicate the amount of the saving effected in the fuel. The apparatus has been working for many months at the factory of Messrs. William Casey and Co., Fountain Bridge, upon a ten-horse high-pressure engine, and I give you, as near as I can, the average result of several trials, made whilst the engine was doing its ordinary work.

With the apparatus, 368lbs. of ordinary *Scotch* coal lasted about five hours, and evaporated 444 gallons of water.

Without the apparatus, 737lbs. of the same coal would only last five hours and a half (or half an hour longer), and evaporate 461 gallons of water.

The apparatus may be made by any smith, adapted to all kinds of furnaces, and fitted up at a few hours' notice, at a cost not exceeding fifty shillings for a single furnace. The patentee evidently wishes every body to take it, by the very moderate charge he makes for its use, which does not exceed 1*l.* per horse power per annum.

I should mention, I have begun to use it myself, and that it is being very generally adopted in this part, both on land and sea, with great success. I have every confidence in the invention, and would earnestly recommend it to the notice of your readers. Yours, &c.,

WILLIAM WATSON.

Main Point Foundry, Edinburgh,
September 18th, 1838.

GIRARD COLLEGE, PHILADELPHIA.

Through the kindness of a professional friend, we have been favoured with two pamphlets respecting the building above-mentioned, which is now in course of erection, under the care of Thomas U. Walter, Esq., Architect. From the description, it appears likely to be one of the most magnificent buildings erected in America; and a print of the elevation which we lately saw, strongly confirms the impression. The cost of the building will be defrayed from the munificent bequest of the founder whose name it bears. The following extracts from one of the pamphlets before alluded to, containing an account of the proceedings on laying the corner-stone, will give some idea of the origin and objects of the Institution.

Stephen Girard was born at Bordeaux, in France, on the 24th day of May, 1750. His first landing in the United States was at the Port of New York; the seat of his residence and successful enterprises was the City of Philadelphia; where he died the 20th day of December, 1831, devising, for the benefit of society, the most splendid donation that philanthropy has ever devoted.

This College, a portion of the beneficence of Stephen Girard, for the education of poor male orphans, was endowed by him with TWO MILLIONS OF DOLLARS.

Mr. Biddle, the President of the Trustees of the College, delivered on the occasion a most eloquent and impressive address, concluding it with these words:—

In the name of Stephen Girard, of the City of Philadelphia, in the Commonwealth of Pennsylvania, Merchant and Mariner, we lay the foundation of this Girard College for Orphans. We dedicate it to the cause of Charity, which not only feeds and clothes the destitute, but wisely confers the greatest blessings on the greatest sufferers;

To the cause of Education, which gives to human life its chief value;

To the cause of Morals, without which, knowledge were worse than unavailing; and finally,

To the cause of our Country, whose service is the noblest object to which knowledge and morals can be devoted.

Long may this structure stand, in its majestic simplicity, the pride and admiration of our latest posterity; long may it continue to yield its annual harvests of educated and moral citizens, to adorn and to defend our country. Long may each successive age enjoy its still increasing benefits, when time shall have filled its halls with the memory of the mighty dead who have been reared within them, and shed over its outward beauty the mellowing hues of a thousand years of renown.

The following is a description of the main building, by Mr. Walter, the architect:—

The Girard College is situated about one and a half miles North-West of the centre of the City, on a tract of land containing forty-five acres; the whole of which was appropriated by Mr. Girard exclusively to the purposes of the institution.

The main building, which is the subject of this description, is composed in the Corinthian order of Grecian architecture; it covers a space of 184 by 243 feet, and consists of an *octastyle* peripteral superstructure, resting upon a basement of eight feet in height, composed entirely of steps extending around the whole edifice; by which a pyramidal appearance is given to the substructure, and a means of approach to the porticoes afforded from every side. The dimensions of the stylobate (or platform on which the columns stand), are 159 feet on the fronts, by 217 feet on the flanks; and the cell, or body of the building, measures 111 feet by 169 feet 2 inches. The whole height, from the ground to the apex of the roof, is 100 feet.

The columns are thirty-four in number; the diameter of the shaft at the top of the base is six feet, and at the bottom of the capital five feet; the height of the capital is eight feet six inches, and its width, from the extreme corners of the abacus, nine feet; the whole height of the column, including capital and base, is fifty-five feet.

The entablature is sixteen feet three inches high, and the greatest projection of the cornice, from the face of the frieze, is four feet nine inches; the elevation of the pediment is twenty feet five inches, being one-ninth of the span.

The capitals of the columns are proportioned from those of the Monument of Lysicrates at Athens; they are divided in height into four courses,—the first embraces the water leaf, and consists of a single stone of seventeen inches in thickness;—the second course is also composed of a single stone, the height of which is two feet ten inches,—the annular row of acanthus leaves occupies the whole of this course;—the third division of the capital embraces the volutes and cauliculi,—this course, which is likewise two feet ten inches in height, is composed of two pieces, having the vertical joint between the cauliculi on two opposite faces;—the fourth, or upper course, being the abacus, is one foot five inches in height.

The ceiling of the portico will be formed by beams resting on the tenia, and extending from the cell of the building to the colonnade opposite to each column; the spaces between the beams will be filled in with rich lacunaria.

The corners of the building are finished with massive antæ, having bases and capitals composed upon the principles of Grecian architecture.

The flanks of the cell are pierced with windows, which are ornamented with the Greek antæ, surmounted with architraves and cornices.

The doors of entrance are in the centre of the North and South fronts; they are each sixteen feet wide in the clear, by thirty-two feet high; their outside finish consists of antepagmenta, of two feet seven inches wide, the supercilium of which is surmounted with a frieze and cornice;—the cornice is supported by rich consoles, of six and a half feet in height, and the cymatium is ornamented with sculptured honeysuckles.

The exterior of the whole structure will be composed of fine white marble, slightly tinted with blue.

The vestibules, which are approached by means of the doors at each end of the building, are ornamented with marble antæ, columns, and entablature, of the Greek Ionic order, which support a vaulted ceiling, consisting of elliptical groin arches, enriched with frets, guilloches, and lacunaria; the columns, which are sixteen in number, will each be composed of a single piece of marble;—the proportions of the order are from the Temple on the Ilyssus at Athens.

The lobbies in the second story are directly over the vestibules, and occupy the same space. The columns in this story, which are also sixteen in number, will be composed in the simplest form of Corinthian or foliated architecture, proportioned from those of the Tower of Andronicus Cyrrhestes at Athens; the entablature will be surmounted with groin arches, similar to those in the vestibules, the soffits of which will be enriched with lacunaria.

The stairways will all be composed of marble; they will be constructed in the four corners of the building, each occupying a space of twenty-two by twenty-six feet, extending the whole height of the edifice; these openings will each be crowned with a pendentive parabolic dome, surmounted with a skylight of ten feet in diameter—the height of the skylight from the floor will be eighty feet.

The building is three stories in height; each of which is twenty-five feet, from floor to floor: there are four rooms of fifty feet square in each story. Those of the first and second stories, are vaulted with groin arches; and those of the third story, with domes supported on pendentives, which spring from the corners of the rooms at the floor, and assume the form of a circle on the horizontal section at the height of nineteen feet. These rooms are lighted by means of skylights of sixteen feet in diameter. All the domes are terminated below the plane of the roof, and the skylights are designed to project but one foot above it, so as not to interfere with the character of the architecture.

The whole building will be warmed by means of furnaces, placed in the cellar; and every apartment will be ventilated upon philosophical principles

The other pamphlet contains the fifth annual Report of the Building Committee. Subjoined to it, there is a Report to the Committee from the Architect; from which we give the following extract:—

The expansible properties of iron having been a subject of considerable conjecture in reference to the bands for resisting the lateral pressure of the arches, I was induced to make an experiment for the purpose of discovering the actual difference of temperature produced in the middle of the walls, by the extreme heat of summer and the severest cold of winter.

Although I have never had an idea that any evil could possibly result from the expansion of the iron in question, by an increase of temperature, the materials which surround it being subject to an expansion almost (if not quite), equal to that of the iron, yet the satisfaction to be derived from positive evidence on the subject is sufficient to give interest to the experiment;—I shall therefore give a brief account of the manner in which it was conducted, so as to enable you to judge how far the result may be relied on.

The place selected for the experiment, was the brick wall between the South vestibule and the large rooms;—the thickness of this wall is five feet five inches, and its distance from the South front of the cell twenty-six feet; the sun had therefore full power upon it during the summer, and in the winter the whole building was covered with a temporary roof:—I should also remark, that the experiment was completed before any fires were made in the furnaces.

On the 23rd of September, 1836, the temperature on the work being at 82 degrees Fahrenheit, a self-registering minimum thermometer was placed upon the iron band in the middle of the wall, and the brick work constructed as solidly around it as the rest of the building.

On the 29th of July, 1837, the temperature being again at 82 degrees, a hole was made in the wall, and the thermometer taken out; when it was found that the register had descended to 42 degrees during the intermediate winter, the extreme cold of which was three degrees below zero:—thus we find the greatest cold in the middle of the walls to be 42 degrees.

On the 16th of January, 1837, the temperature on the building being 24 degrees Fahrenheit, a self-registering maximum thermometer was placed on the iron band in the middle of the aforementioned wall, on the same horizontal line with the other thermometer, and about sixty feet distant from it, a space having been left in the wall when it was built, for the purpose; which space was walled up around the thermometer, as firm and compact as the rest of the work.

On the 16th of December, 1838, the temperature on the building being again at 24 degrees, the walling was taken out; when it was found that the register in the thermometer had risen to 61 degrees during the intermediate summer, the greatest heat of which was 94 degrees.

We have therefore 42 degrees for the lowest temperature of the iron bars, and 61 degrees for the highest, making a difference of 19 degrees.

The expansion that an increase of temperature of 180 degrees produces upon malleable iron, is given by Dr. Ure, in his Dictionary of Chemistry, as follows:—

From experiments by Smeaton $\frac{1}{704}$ of its length; according to Borda's experiments $\frac{1}{865}$ of its length; and according to Dulong and Petit $\frac{1}{846}$ of its length.

Mr. Hassler (of New Jersey), in his "Account of Pyrometric Experiments," read before the American Philosophical Society, June 29th, 1817, finds the expansion to be equal to $\frac{1}{767}$ of its length; and in a work on Natural Philosophy, by Biot, we have the experiments of Lavoisier and Laplace, made in 1782, giving an expansion, under the same increase of temperature, equal to $\frac{1}{819}$ of its length.

The trifling difference in these results may be attributed to a difference in the density of the material:

Now, if 180 degrees will increase a bar $\frac{1}{773}$ of its length (this being the greatest expansion obtained by the foregoing experiments), 19 degrees will lengthen it only $\frac{1}{7326}$; hence the bands around the rooms of the College (each being 54 feet long from the points of support), will be subjected to a difference in their length between the extreme heat of summer and the severest cold of winter, of $\frac{1}{7326}$, or $\frac{1}{12}$ of an inch.

This being the actual difference produced in the length of the iron bands, by the greatest change of temperature to which they can be subjected, it remains for us to consider the expansibility of the materials with which they are surrounded.

A table of the expansion of different kinds of stone, &c., from an increase of temperature, is given by Mr. Alexander J. Adie, civil engineer, in a paper read before the Royal Society of Edinburgh, on the 20th of April, 1835,* in which he makes the expansion produced upon bricks by 180 degrees of Fahrenheit, equal to $\frac{1}{1818}$ of their length, or $\frac{1}{28}$ of an inch in 51 feet under an increase of temperature of 19 degrees.

If, therefore, the maximum expansion of one of the iron bands in the walls of the College is $\frac{1}{12}$ of an inch, and the brick work surrounding it $\frac{1}{26}$, the difference is then reduced to nearly $\frac{1}{22}$ of an inch:—but if we consider that the variation of temperature in the interior of the wall is only 19 degrees, while the exterior is subjected to the extremes of heat and cold, it will be obvious that the aggregate expansion and contraction of the brick work is even greater than that of the iron.

From these considerations, it is evident that not the slightest injury can possibly result from the use of iron in the construction of the College.

THATCHED HOUSE NUISANCES.

(Extracted from a very useful publication, "LOUDON'S SUBURBAN GARDENER AND VILLA COMPANION.")

A thatched cottage is an object of admiration with many persons who have not had much experience of country life, and accordingly we find several in the neighbourhood of London. Such cottages have, perhaps, the gable end covered with ivy, the chimney tops entwined with Virginian creepers, and the windows overshadowed by roses and jasmines. The ivy forms an excellent harbour for sparrows and other small birds, which build there in quantities in spring, and early in summer, and roost there during winter. In June, as soon as the young birds are fledged, all the cats in the neighbourhood are attracted by them, and take up their abode in the roof of the house every night for several weeks, the noise and other annoyances occasioned by which we need only allude to. We say nothing of the damp produced by the deciduous creepers and the roses, as we have already mentioned that, but we must here notice another evil, which is not so obvious, though quite as serious, and this is the numerous insects generated in the decaying thatch, and more especially that loathsome creature the earwig, which in autumn, whenever the windows are open, comes into the house in quantities, and finds its way into every closet, chink, piece of furniture, and even books and papers. All cottages of this kind harbour snails and slugs in the ivy, and spiders under the eaves of the thatched roof, and wherever there are spiders there are also abundance of flies. As there is always a garden attached to such cottages, it is almost certain, if on clayey soil, to abound in snails, slugs, worms, and, if the situation is low, perhaps newts. Some of these from the doors, or, at all events, the back door, being generally kept open, are quite sure to find their way, not only into the kitchen, but even into the pantry and cellars. Slugs, when very small, will enter a house through a crevice in the window or a crack in the door, find their way to the moist floor of the pantry or the cellar, and remain there for weeks, till they are of such a size that they cannot retreat. There are few persons, indeed, who do not experience a feeling of disgust at seeing the slimy traces of a slug in any part of their house, not to speak of finding them in dishes in which food is kept, or even on bread, or at discovering an earwig in their bed or on their linen. The kitchen, in low damp cottages of every kind, almost always swarm with beetles and cockroaches, and the pantry with flies; while, from the closeness and want of ventilation in the rooms, it is almost impossible to keep fleas, &c., from the beds. If a large dog be kept in or near the house, as it frequently is, or if a stable or cowhouse be near, the fleas from the dog, the horses, or the cows, which are larger than the common kind, will overspread the carpets, and find their way to the sofas and beds. Having lived in cottages of this kind in the neighbourhood of London, we have not stated a single annoyance that we have not ourselves experienced; and we have purposely admitted some. Two of these, offensive smells and rats, are the infallible results of the want of proper water-closets and drainage; but these evils, great as they may seem to be, are much easier to remedy than the others already mentioned, which are, in a great measure, inseparable from the kind of house. Two others, the danger of setting fire to a thatched roof, and its liability to be injured by high winds, are sufficiently obvious; but it would hardly occur to any one who had not lived in a house of this description in the neighbourhood of London, that a thatched roof is of all roofs the most expensive, [illegible] in repair. A plumber or a slater to repair a lead or a slate roof may be found everywhere in the suburbs of large towns; but a professional thatcher must be sent for from the interior of the country. For example, the nearest cottage-thatchers to London are in the hundreds of Essex on the east, and in Buckinghamshire on the west.

FAILURE OF A SUSPENSION BRIDGE.

A letter from Fribourg, in Switzerland, states that a few days since, all the surrounding population repaired to Corbieres, to witness the opening and proving of the strength of the new suspension bridge. At 12 o'clock, the principal authorities and engineers being present, a train of 20 carts laden with gravel, was made to cross the bridge, which bent but very slightly under the weight. The same train of carts was again drawn upon the bridge, and kept stationary, and to this weight was added that of a great number of the spectators; when instantly a loud crash was heard, and the bridge swung violently, in consequence of the two cylinders, over which the chains passed, and which rested on the two pyramids on the Corbieres side of the river, having given way, and broken into a thousand pieces. The terror and consternation were universal, but fortunately no person was injured; and the accident, which in no degree affects the question of the solidity of the bridge, will require only a short time to be repaired.—*Morning Post, August 2nd.*

BRITISH MUSEUM.

Estimate of the Expense of Completing the New Buildings.
(From a Parliamentary paper.)

The north-west building for the print-room, library, &c., estimated at 19,000*l.*, and since enlarged by direction of the trustees . . .	£20,500
The south front building, extending between the wings, with the portico, colonnade, &c.	82,000
The south-west building, and the colonnade adjoining it	60,000
The gallery at the western extremity of the south front	10,000
Arrangements proposed in the upper floor of east wing for the reception of the zoological and botanical collections	3,000
The officers' houses, with the secretary's offices and buildings, connecting them with the Museum	36,000
Probable expense of the iron palisading along the south and east fronts, entrance lodge, dwellings for the attendants and others, guard-house, forming and paving the front quadrangle, &c.	15,000
	£226,500

With the addition of 10 per cent. for contingencies, the total estimated charge will be 250,000*l.*, to be spread over the period of five or six years, that being the probable time which will be required for the proper execution of the works.

To this sum of 250,000*l.* there must be added the sum which will be required for the purchase of certain houses, ten in number, and the site they occupy, which are the property of his Grace the Duke of Bedford. The plans of Sir Robert Smirke are framed in some of their details upon the assumption that the buildings and site abovementioned, together with any interests in existing leases, can be purchased for a sum not exceeding their fair value.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

REPORT OF PAPERS READ AND PROCEEDINGS, SESSION 1838.

(Continued from page 292.)

Thames Tunnel.

Mr. Brunel stated that they were at present* more inconvenienced by fire than by water. Some of the gases which issue forth, ignite very rapidly; and the reports from Guy's Hospital stated some of the men to be so injured by breathing these gases, that small hopes were entertained of their recovery. The explosions are frequent, and put out the candles of the workmen; but the largeness of the space prevents their being dangerous. The thickness of made ground above them is about 18 feet. He conceives that these deleterious gases issue from the mud of the river; they proceed from a corner at the top. They had used chloride of lime, but without any great success; there appeared no remedy for the inconvenience. The breathing the gas produces sickness.

Explosion of Steam Boilers.

A communication was read from Mr. Timperley, of Hull, on the explosion of the boiler of the Union steam-packet at that place last summer. This was attributed to the water in the boiler having become so far reduced as to lay bare the tops of the flues, which would probably be heated to a very high temperature. Water coming in contact with them in this state, on a slight lateral motion of the vessel, steam of sufficient intensity to produce the effects described might be produced.

Mr. Macneill stated that the boiler plates had in the above instance been rent across like a sheet of paper. There was not a single rivet broken.

A long discussion took place on the causes to which these extraordinary cases could be referred: the violence of the explosion on bursting, appearing greater than could be referred simply to the pressure of the steam. If the water were supposed to be decomposed by contact with the hot plates, some of the oxygen would be absorbed by the metal, and the proportion requisite

* See Journal, No. IV. page 76.

* May 15.

for an explosive mixture destroyed. But there were great difficulties in conceiving the decomposition of water by the plates of a boiler. The commission of the Franklin Institute concluded this to be impossible.*

It appeared then, that there were grounds for doubting the fact of the presence of oxygen, such as would cause an explosion. And it seemed almost unnecessary to resort to any such explanation, as the sudden generation of steam of high elasticity would produce a pressure sufficient to blow out or rend the boiler in the weakest part, before the pressure could be transmitted through the steam to the safety valve. The transmission of pressure through an elastic fluid requires time, but the action on the solid is instantaneous.

It was suggested whether a large portion of hot surface might not become suddenly exposed by the cracking off of the incrustation on the sides of the boiler. The metal expands more rapidly than the incrustation; portions of the latter may crack off and expose a large extent of hot surface to the steam and water; a sudden increase in the elastic force of the steam would necessarily ensue. The incrustation is itself a bad conductor of heat.

Mr. Field, in reply to a question respecting the rapid decay of the bottoms of copper boilers, stated, that copper is very rapidly injured by repeated heatings, and will not long bear high degrees of temperature.

Mr. Cubitt stated that he had not known of any case of explosion of a boiler containing plenty of water. With respect to a recent accident in America, which had taken place soon after the boat had started, he thought that a boiler was more likely to be short of water at starting than at any other time, for the steam will probably have been blowing off for some time, and the men have neglected to supply the boiler; whereas after the vessel has started, the pumps worked by the engine supply the boiler. He should think that a boiler is more likely to be short of water before or just after starting, than at any other time.

Mr. Field stated that the vessel had stopped, and the explosion took place while taking up a passenger; the safety valve had been held down. In all these cases of explosion the difficulty which he experienced was, how to account for the pressure being suddenly increased by the amount which must be supposed. It did not appear to him sufficient to suppose that water flowed over hot flues. If the whole of the top of the fire-place were red hot, this could not produce the effect. The steam boilers in America are generally of a form ill adapted to resist pressure.

Mr. Buddle stated that the only clearly ascertained fact seemed to be, that these explosions took place when the boilers are dry. He had a case of twin boilers, standing side by side; the dry one exploded; no cause could possibly be assigned but that it was dry. The steam communication betwixt the boilers was free, by a pipe *eight* inches diameter. It was not a collapse, but the boiler was torn into a thousand pieces. There are two distinct cases; the one a rent or bursting, the other an explosion, in which the parts are thrown to a considerable distance.

Mr. Cubitt called attention to the remarkable case mentioned by Mr. Buddle, of two boilers connected together by a steam pipe of eight inches diameter, the communication free betwixt them, but one short of water; the other having its proper quantity of water. The dry boiler blew up with a great explosion, the other remaining uninjured. The steam was blowing off at the time. With respect to the nature of the report, Mr. Buddle stated that he had not himself heard it, but it was represented as sudden and short; any representation of this nature cannot be depended on, as two persons situated in different positions will give very different accounts. This had occurred to his knowledge on the explosion of a coal mine. He was close by, and thrown down; the report was smart like that of a six-pounder; at two miles off, it was like a peel of thunder, shaking the houses and throwing down the furniture. One peculiar feature in the explosion of the steam boilers is the rending and crumpling up of the boiler plates. The plates are rent and twisted as if of paper.

Steam Expansion Table. By George Edwards, M. Inst. C.E.

A paper by Mr. Edwards was read, descriptive of the principle and method employed in dividing his Steam Expansion Table, an account of which had been laid before the Institution last session.

History and Construction of Westminster Bridge, accompanied with detailed Drawings. By F. Whishaw, M. Inst. C. E.

This account of Westminster Bridge has been extracted from the very voluminous documents in the Westminster Bridge Office, access to which was given to the author of this paper by the kindness of Mr. Swinburne, the resident engineer to the bridge.

The first act was passed in 1736, and empowered certain commissioners to raise moneys by lottery. Three sites were pitched upon; the Horse-ferry, over against the Palace Yard, and over against the Woolstaple, which latter was finally fixed on. The scheme was violently opposed by the city of London and the Thames watermen. The commissioners selected a very curious and well-designed wooden superstructure, by James King; but having determined that the bridge should be of stone, they accepted a proposal from Mr. Labelye to found one pier by means of caissons, and which he had offered to build at his own expense.

This bridge, so lasting a monument to the genius of Labelye, consists of fifteen semicircular arches, decreasing regularly in span by 4 feet from the centre, which measures 76 feet, to the sixth arch on each side, which is 52 feet in span; all the arches spring from the line of low water of 1736. The whole distance between the abutments is 1068 feet, with 870 feet clear waterway, and 198 feet solid. A peculiar feature in this bridge is, that the spandrels are formed of radiated Purbeck blocks, with occasional bond stones, and the interior filled with ballast and rubbish.

The design of Mr. Labelye was the only one for laying the foundations of the piers under water, and the application of caissons for this purpose then first took place. The construction of these caissons and method of founding the piers by means thereof are fully described and illustrated. The piles were driven by an engine invented by Mr. Valoue, a watchmaker; it was erected on a platform, fixed on the top of a barge, and worked by three horses walking round and turning an upright shaft, on which was fixed a large cog-wheel and a drum, on which the rope was wound, and passing by pulleys to the top of the guide frames was connected with a follower furnished with tongs, as in the common pile engine. The number of strokes in an hour was about 150, at an elevation of 9 feet; the weight of the ram 1700lbs. The piles were generally cut off; the time occupied in cutting off a pile about 15 inches square and 10 feet under water being not more than a minute and a half. The construction of the abutments and of the arches is fully described, and the quantity of stone employed in the middle 76-feet arch, and the two adjoining 72-feet, is stated; the expense of these three arches was £24,074.

The centres employed were on the principle of the diagonal truss; for the five middle arches three rows of piles were driven on each side to support the centres, and for the other arches only two rows. Each centre consisted of five ribs of fir timber, resting on transverse and longitudinal oaken plates. The five centres used on the Westminster side were afterwards used for the corresponding arches on the Surrey side; the striking of the centres was first performed by means of circular wedges of a peculiar construction; this mode, however, from its expense, was superseded by straight wedges.

A most interesting portion of the history is that which relates to the 15feet sunken pier. There was no piling under the caisson bottoms, and the removal of gravel of the bed of the river very near the pier in question occasioned consequently a sinking. The progress and nature of the sinking are accurately detailed. The south point had settled 14 inches and the north point 13 inches; and the sinking still going on, it was determined to remove the superstructure above the sunken pier and damaged arches; the sinking still continued, but at last appeared to stop, and the whole amount was found to be 3 feet 4 inches at the north-west angle, and 2 feet 7 inches at the south-east angle, of the pier. Centres were erected under the two damaged arches, the adoption of which plan was recommended to the commissioners in the following words:—"If the pier should settle much more, it is not in the power of any mortal agent or agents to hinder the arches from following it, as long as it is possible; and therefore, in that case, the two arches instead of parting asunder, and their materials falling into the river, and not to be taken up without a great expense of time and money, will be received and their materials supported and secured, in order to their being regularly unbuilt." The pier, however, lightened as above described, did not continue to sink, and the weight over the piers was considerably reduced by introducing segment arches over the 15 feet pier, and half arches over the adjoining piers, leaving a considerable void space beneath each.

Labelye presented to the commissioners several reports on the open joints, on the sunken pier, on the Surrey New Road, and on the completion of the works. These are most interesting, serving, as they do, to exhibit the state of engineering at that time in the country.

A detailed account is also given of the ingenious wooden superstructure designed by Mr. James King, and of Mr. Batty Langley's design for a wooden bridge at the Horse-ferry. The author has also collected, at immense pains, the prices of materials and of labour, as paid in the erection of Westminster Bridge; he has also compiled a journal of works from the commencement of the undertaking to the time the bridge was opened. These most interesting and instructive documents are collected from the voluminous records deposited in the Bridge Office.

The paper is accompanied by an atlas of eleven drawings, showing the site and all the details of the bridge, with facsimile signatures of Charles Labelye the engineer, and Messrs. Jelfe and Tufnell the contractors.

The Council of the Institution of Civil Engineers give notice that they will award, during the ensuing session, Telford premiums to communications of adequate merit on the following subjects:—

1. The nature and properties of steam, especially with reference to the quantity of water in a given bulk of steam in free communication with water at different temperatures, as deduced from actual experiment.

2. The warming and ventilating public buildings and apartments, with an account of the methods which have been most successfully employed for ensuring a healthy state of the atmosphere.

3. An account and drawings of the original construction and present state of the Plymouth breakwater.

4. The ratio, from actual experiment, of the velocity, load, and power, of locomotive engines on railways.

 1st. Upon levels.
 2nd. Upon inclined planes.

5. The sewage of Westminster.

6. Drawings and description of the outfall of the King's Scholar's Pond Sewer, and of other principal outfalls of the Westminster sewage; also, the inclination, dimensions, and forms, of the sewers, and the observed velocities, of water in them.

7. Drawings and descriptions of the sewage under the commission for Regent-street, especially of the outfall at Scotland Yard.

* See Report of Franklin Institute on the Explosion of Steam Boilers.

8. Drawings and description of the best machine for describing the profile of a road, and also for measuring the traction of different roads.

9. The alterations and improvements in Blackfriars Bridge.

10. The explosion of steam boilers.—Especially a record of facts connected with any explosions which have taken place: also, a description, drawings, and details, of the boiler, both before and after the explosion.

11. Drawings, sections, and descriptions, of iron steam vessels.

12. The comparative advantages of iron and wood, as employed in the construction of steam vessels.

13. The advantages and disadvantages of the hot and cold blast in the manufacture of iron, with statements of the quality and quantity of the materials employed, and produce thereof.

14. The causes of and means of preventing the changes in texture and composition which cast iron occasionally undergoes when in continued contact with sea water.

15. The properties and chemical constitution of the various kinds of coal.

The communications must be forwarded to the house of the Institution,* on or before the 30th of March, 1839.

It is not the wish of the Council to confine the Telford premiums to communications on the above subjects; other communications of distinguished merit and peculiarly deserving some mark of distinction, will be rewarded.

July 9, 1838. THOMAS WEBSTER, Secretary.

* All communications previous to the 25th of December, 1838, to be addressed to Cannon Row, Westminster; after this, to No. 25, Great George Street, Westminster.

ARCHITECTURAL SOCIETY.

We are happy to hear that there is no fear of this society being dissolved in consequence of the withdrawal of several members. We understand, that at the first meeting of the ensuing session, the names of several influential members of the profession will be announced as having joined the society; among whom are Messrs. Tite, George Smith, Ianson and Savage.

MANCHESTER ARCHITECTURAL SOCIETY.

On Wednesday Evening, 5th September, the Seventeenth General Meeting of this Society was held in their Rooms in Mosley street.

Mr. J. W. Hance, the secretary, read the first of a series of papers investigating the principles of a new system of perspective, which has created much sensation, invented by Mr. Parsey, of London, who, it will no doubt be remembered, delivered a course of lectures on the art in this town, in the early part of the present year. After a few prefatory remarks on the necessity of a knowledge of perspective to all who wished to attain even a tolerable proficiency in drawing, Mr. Hance proceeded to compare the principles of Mr. Parsey's system with those of the usual one, pointing out their discrepancies. Assuming as his data—1st, That for any art or science to be of practical utility, it must be based on sound principles, *invariable* and *immutable*; 2nd, That of two systems relating to art, that must be the better which is the *more simple in practice*, and whose results are more in accordance with *natural* effects; 3rd, That any practice, even if sanctioned by long custom, which can be proved to be founded on *false principles*, is unworthy of support, and should be discarded by those who are anxious to follow the truth. Mr. Hance remarked that perspective was generally defined as a section or cutting by the plane of delineation or picture, of the rays supposed to proceed from the object viewed to the eye of the observer, and was often familiarly illustrated by supposing a window, plate of glass, or other transparent plane, to be interposed between the eye and the object; the figure generated on the glass, &c. by the rays, would be the perspective representation of the object; and to perform this upon an opaque surface, such as paper or canvass, by mathematical rules, is the science of perspective. Upon the placing of the picture, or plane of delineation, the whole operation depends; and this was the point to which he should confine the present investigation. Great diversity of opinion prevailed about the mode of fixing this plane; but he thought he should be able to prove that Mr. Parsey's assertion was correct, "That we cannot *choose* the plane, but that Nature herself marked it out." All we have under our control in viewing an object is, to fix the position of our eye relative to it; which being once fixed, only *one* image or figure could possibly be impressed on the mind. There must, therefore, be only *one fixed invariable natural* plane, intersecting the rays of vision in the same manner under all circumstances and in all cases; and if this were transposed into a sensible, tangible plane, such as a picture, &c., no alteration would take place in the image seen. Now he would prove, by a small diagram, this natural plane to be, as in Mr. Parsey's system, at *right angles to the axis of vision* or centre of the system of rays, which is always in the centre of the object viewed—for in this way only can we obtain the same result in all cases; and as it would be obvious that by the usual system it was possible to obtain *two or more* representations of the original object with *the same given data*, it must be manifest that it is erroneous, and cannot be depended on as affording satisfactory results. After Mr. Hance had concluded his remarks, which were listened to with much interest, an animated discussion took place; and it was the unanimous opinion of the meeting, "That Mr. Parsey's mode of finding the plane of delineation is the *correct* one."—*Manchester Guardian.*

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Eighth Meeting, held at Newcastle-upon-Tyne.

AUGUST, 1838.

Another meeting of the Association has taken place; and although it has been more successful than its predecessors in the number of its attendants, it has undoubtedly proved less interesting in its scientific results. Much, however, cannot be expected, for it is not by accumulating philosophers that we shall be able to extract the quintessence of science. These meetings generally prove little more than travelling shows, for exhibiting the lions of the intellectual world.

In the Mechanical Section, which is our more appropriate sphere, very little occurred beyond the reading of papers, the best of which might just as well have been published long since in some of the scientific periodicals, instead of bottling them up for a twelvemonth. Dr. Lardner distinguished himself on this, as on previous occasions. The year before last he proved beyond doubt, to all the novices in England, the impossibility of Atlantic steam navigation, and the country is indebted to *him* for having caused considerable impediment to its progress. However, the enterprize of the "Great Western" people having shown the Doctor's error, he felt himself called upon to prove that he was still in the right. We have heard of doctors apologizing for the death of their patients, but never before for their recovery. As the worthy philosopher could not now persist in the absolute impracticability of the undertaking, he has endeavoured, after the Quaker maxim, of 'give a dog a bad name,' to knock it on the head by asserting that it can never pay. We shall not combat this assertion at present, but leave the Doctor to do it next year, as he doubtless will try to do. We shall wait patiently for his next antic, and shall feel happy when he has got out of the slough of animal magnetism, to hear him come forward next year with proofs of the truth of that piece of quackery.

It would have shown a culpable degree of negligence in any other man, that the most important grant ever made to the Mechanical Section—that for determining railway constants—has not been made use of. We call this culpable, because in the present infant state of railway science, every month that is lost in obtaining data is of more importance than years in its subsequent progress. It is not the mere paltry amount of money that we regard, but it is the extent of capital ultimately affected by the results of these experiments; for, as they will certainly produce more accurate data, so they must most essentially influence every railway, whether in contemplation or in progress. We know the loss of capital incurred by the Liverpool and Manchester and the Birmingham Railways, and the doubts existing at present with regard to the plan of the Great Western Railway, would have induced any well-thinking man to have pressed the determination of this question, rather than to have lost time. Dr. Lardner, however, thought otherwise, and instead of producing a report, amused the section by informing them how he intended to do what he had not done.

He amused the section with another pretty toy, for registering the operations of steam engines, which was to do a great number of things, but not to tell the distance to New York, which had already been published in the Monthly Chronicle.

The only discussion of any utility was that on the gauge of rails, and we regret that it was suddenly stopped by the president, and not allowed to be resumed. The section could find time to hear papers, that had been published previously or read at the last year's meeting, or scramble through the titles of others like the third reading of an Act of Parliament, but they had no time for an object in which millions of capital are interested. The calibre of these philosophers' minds was more appropriately employed in investigating important objects, and they had no time to devote to useful purposes. One of the favoured children of philosophy delighted them by letting them rummage an improved writing table, which had this unique advantage, that all the drawers could have their locks picked at the same time. Another philosopher occupied the time of the meeting, by explaining an apparatus for cooking by gas!

The ironmasters, who made such a distinguished figure last year, by their enlightened opposition to the experiments on iron, did not make their appearance at this meeting, doubtless to the loss of much scientific knowledge.

Although, considered on the whole, the local preaching of the Association is productive of no very powerful results to science, as in their itinerant circuits they judge and condemn nobody but themselves; yet their ambulatory meetings in their course over the country, offer good opportunities for examining and discussing the merits of the different lines of railway. Newcastle, almost the father land of railways, possesses particular advantages for engineers; as, independently of the fine school of study afforded by the numerous tramroads and railways, it is one of the great seats of the manufacture of locomotive and marine engines.

With regard to architecture, and all departments of art, they are excluded from the operations of the Association; but why they should be so, there is certainly no reason either in the constitution of the Society, or in the relation of these objects to the other pursuits of science. Architecture requires an extensive knowledge of the mathematical and philosophical sciences, and we can conceive no argument for the admission of many papers read at the meeting, to the exclusion of the votaries of that art, which, as well in the pyramids of Egypt as in the latest of its works, has elevated some of the finest monuments of practical science. It might not be unproductive of advantage to give young architects an opportunity of examining provincial works during their holydays at these Saturnalia of Minerva. In most of the cities of meeting, and particularly at Oxford, Cambridge, and Dublin, are

many fine edifices; and Newcastle has recently exhibited considerable improvement in this respect.

Another improvement which might be introduced into the Association would be either to form a section for arts, manufactures, public works, colonies, and commerce, or else make them a part of the statistical section. With regard to public works particularly, it would effect great good to afford facilities for their study, and for the centralization of information on the subject. It is only recently that the attention of individuals has been directed to forming a correct body of practice of canals, and there are plenty of other branches which would benefit essentially by their more enlightened study.

(From the Athenæum.)

Section G.—Mechanical Science.

On a new Day and Night Telegraph, by Joseph Garnett.

The paper on this subject was accompanied by a model, to exhibit the construction and method of working of the telegraph, which it is proposed should consist of two ladders, about forty-one feet long, framed together at about twenty-four inches asunder at the bottom, and twenty at the top, so as to constitute the frame for the machinery. There are two arms, one at the top, the other about midway up the frame-work, counterpoised by weights, and worked by machinery, consisting of eight bevel mitre wheels. At the bottom of the frame work is a dial plate, with a pointer, and the workman, in setting the pointer, brings the arm of the telegraph into the required corresponding position. The paper proceeded to describe the mechanical adjustments, and was accompanied by tables of the day and night signals, each of which contains fifty-six variations of the arms. The night signals are made by covering the lamps in a particular order. For instance, two vertical lamps covered designate twenty—two horizontal ones covered thirty—and so on.

On Isometrical Drawing, by Thomas Sopwith.

The object of the author in this communication was, to call attention to certain instruments, by which the operation of isometrical projection is greatly facilitated. These are a set of triangular rulers, drawing paper, with the lines and ellipses described upon it, and the isograph, which consists of a number of rulers, made of brass or ivory, the fiducial edge of each being an inch apart, and parallel to each other. The triangular rulers are serviceable for making projections of the angles of isometrical cubes, and the isograph is peculiarly adapted for copying maps. Some specimens of maps so copied were exhibited. Mr. Sopwith gave a detailed account of the way in which he used the above instruments for the purposes of isometrical projection.

On the Power of Economizing and Regulating Heat for Domestic Purposes, by George Webb Hall.

The author insisted on the necessity of having the backs of the fire-places vertical, and the apertures of the chimneys as contracted as possible; and he described the results of his experiments. One principle to be universally attended to in close fire-places is, that the burning fuel be surrounded by a substance retentive of heat, and capable of radiating it back upon the fire itself. This is attained by covering the fire itself with a species of fire-brick, and only allowing a very small aperture for the escape of the heat thus forced off at the highest degree attainable, then to be economized by close confinement and regulation. The economy of heat when attained, consists in conducting the hot air through long and horizontal flues, so as to counteract as much as possible its tendency to ascend, which tendency is exactly proportional to the temperature. The author illustrated the preceding paper by details of the arrangements which he had adopted, and alluded especially to the researches of Rumford on this subject.

Notices on the Resistance of Water, by John Scott Russell.

Mr. Russell stated, that the observations he had to offer might be considered as a sequel to what had been given at the preceding meetings of the Association. He and Sir John Robison had been constituted a committee to prosecute the investigation of the motion of waves, and other problems in hydrodynamics, the results of which would be given in the Physical Section. But, as they went on, they had met with some results of great value to the practical man; of these, he now proposed to give a brief account to the Section. The general problem was the resistance of a fluid to a floating solid. Now, this is a department of science, of which we are avowedly ignorant; so much so, that some of our best vessels are acknowledged to be constructed by the rule of thumb, as it is termed—that is, by knowledge gained from a repeated series of trials and errors, and not on any fixed scientific principles. It had been ascertained in previous investigations, that the action of a solid on the water is very different from the action of fluid when impinging on a solid. These actions had formerly been considered the same. The solid causes an elevation; the elevation puts the water in motion. Thus, the question of resistance resolves itself into that of the motion of waves. Waves are of various kinds. The laws of the great primary wave had been laid down in previous communications. Its velocity depends simply on the depth of the fluid. The old law of resistance, as the square of the velocity, is too small so long as the velocity of the solid is less than that of the wave, but too great so soon as the velocity of the solid becomes greater than that of the wave.—Mr. Russell then detailed some experiments which had led to the above law, and from which it appeared that the form of the vessel of least resistance depends as well on the velocity with which it is to move as on the velocity of the wave; also that the form which is best for moving with a velocity less than the velocity of the wave, may be worst for moving with a velocity greater than that of the wave. The consideration of the laws of this wave reconcile many of the discrepancies in experiments on this subject. Mr. Russell then proceeded to describe some remarkable facts, which they had observed on the motion of the particles constituting this wave; the particles had a vertical and a horizontal motion, and the extent of the motion depended on the force of the wave. Another remarkable result is, that the ordinates of the vessel should correspond with the ordinates of the wave; a form so constructed would separate the water without any apparent elevation or white ripple, which was common to all other forms. The form is that which belongs to the wave, which is to move with the particular velocity of the vessel.

The accompanying diagrams will serve to convey a more distinct idea of the nature of the motion of the particles of the water.

Fig. 1.

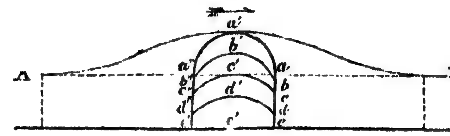


Fig. 2.

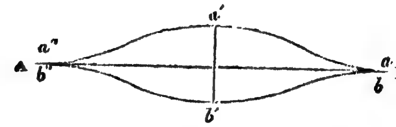


Fig. 1 shows the form of the wave, and the lines of translation of the particles during the transit; A a' B the line of the wave; $a\ a'\ a''$, $b\ b'\ b''$ $c\ c'\ c''$ &c., lines of translation of the particles during the transit.

Fig. 2 shows how the lines of a vessel are to be formed so as to produce a displacement analogous to the displacement of the wave, and so move through the fluid with the least resistance.

On the Principles of Oblique Bridges, by Peter Nicholson.

The oblique arch, an invention of comparatively recent date, has been rendered necessary by the general adoption of railways, and by the necessity which exists for their being carried forward in lines as direct as possible. The theory of this arch is attended with some difficulty, and the author lays down in this paper the principle by which the engineer should be guided. Five of the faces of each stone are to be prepared in such a manner that four of them recede from the fifth, and when the stones are arranged in courses, the surfaces of the fifth face form one continued cylindric surface, which is the intrados, and the other four faces form the beds and ends of the stones in which they join each other. In every course two of the opposite courses of the first stone, two of the opposite surfaces of the second stone, and so on, form two continued services throughout the whole length of each course, and the edge of each of these continued surfaces in the intrados will be a spiral line. If a straight line be drawn through any point in one of the spiral lines perpendicular to the axis of the cylinder, the straight line will coincide with that continued surface which is a bed of that course, and the straight line thus drawn will be a tangent to the curved surface of the cylinder at that point in the spiral line; the straight line then drawn will be perpendicular to another straight line, which is a tangent to the spiral line at that point. The intrados being developed, the spiral lines which form the edges of the courses will be parallel and their distances equal, and the spiral lines which are the edges of the ends of the stones will be developed in straight lines perpendicular to those lines which are the developments of the spirals of the edges of the courses. From these principles a simple geometrical construction may be deduced, such as the workman can readily use. To construct an arch on the above principle it is only necessary to know the angle of obliquity of the acute angled pier, the width of the arch within its abutments, the height of the intrados above the level of the springing, the perpendicular distance between the planes and the two faces, and the number of arch stones in each elevation. The author then detailed some examples illustrative of this method.

Remarks on the Material and Mechanical Construction of Steam Boilers, by W Greener.

Mr. Greener is of opinion that the accidents which happen to steam boilers are principally due to defect in the material of which they are constructed; and he details several experiments made on slips of iron cut from plates of different quality. He found that slips cut latitudinally from a plate bore less by 30 per cent. than slips of the same dimensions cut longitudinally; in some cases the difference was much greater. He also had immersed plates in a mixture of sulphuric acid and water, and found that the injury done in twenty-four hours varied from 6½ to 15 per cent. of the original strength. Many boilers will stand so long as the form remains perfect; but should any part, as the crown of the arch, in cylindrical boilers, collapse, an accident is inevitable.

On a Substitute for the Forcing Pump in supplying Steam Boilers, &c., by Mr. Maule

It was a hollow cock having an orifice, which, being uppermost, the plug became filled with the liquid, and then, being turned half round by the motion of the piston, the liquid could run into the vessel below.

Sir John Robison explained a *model of the bucket of a pump in use i*

Sweden, the peculiar feature of which was, that the pressure of the sides of the bucket outwards against the pipe is exactly proportional to the load to be raised. This bucket is peculiarly applicable for raising foul water.

A New Rotatory Steam-Engine, by S. Rowley.

The inventor being absent, Mr. Evans undertook to bring this before the Section; and having pointed out the construction, stated that the only novelty in this consisted in the eccentric being on the inside. Many present condemned the rotatory engine as mechanically impracticable. Many of the most talented mechanics of this country had given up the attempt after repeated trials. It was argued, that no theoretical advantage can be gained by it; and that though there might be some circumstances under which economy of space and first cost were of such importance that the most expensive wear and tear could be borne, yet no prudent man would purchase an engine which might ruin him in the repairs. It is not sufficient to have a good theory; the powers of mechanical construction must be considered; many inventions which thirty years ago might have been lost, because they were antecedent to the march of the mechanical art, would now, in the wonderfully advanced state of this art, be generally introduced.

Report on Railway Constants, by Dr. Lardner.

Dr. Lardner stated, that at the last meeting of the Association a sum of money had been voted for the purpose of ascertaining certain railway constants,—that is, the force of traction on a level plane; the resistance due to friction, to curves, to the atmosphere; how the force of the wheels and the carriages influenced the motion. He then explained the causes which had prevented the experiments being made, and that, consequently, he had nothing to report as experimentally determined on the above subject; but that he had that instant received a set of experiments on the above subjects, made, at his request, by Mr. Woods, the resident engineer of the Liverpool and Manchester Railway, a young man whose excessive modesty alone prevented his occupying the position which his talents could claim. Some of these results, especially those relating to the effect of the resistance of the atmosphere, he then alluded to. He then described the various methods which had been proposed for the determination of the constants in question. These differed in no respect from the statements which were made last year at Liverpool. He also described a dynamometer, by which the traction might be measured with considerable accuracy; and concluded, by adverting to the great experiment which was now trying on the Great Western Railway, with respect to the gauge of seven feet instead of four feet eight inches.

An improved Method of Constructing Railways, by J. Price.

This method consists in fixing rails on a continuous stone base, a groove having been made in the stone to receive a flange or projection of the lower side of the rail. The stones and rails are to break joint with each other, and the chair by which the rails are to be secured is to be made fast to the rail by a bolt, not rivetted, but slipped in. The chair is to be sunk until the top is level with the top of the stone, and fastened to it by two small wooden pins. Any sinking of the road is to be obviated by driving wedges of wood underneath the stone until it is raised to the required height. The chairs are to be fixed at about 4 feet apart, and to weigh, if of malleable iron, 14 pounds, but if of cast iron, 20 pounds: the rail to weigh 50 pounds per yard.

On the Construction of a Railway with Cast-Iron Sleepers, as a substitute for Stone Blocks, and with continuous Timber Bearing, by T. Motley.

The cast-iron sleepers, which are wedge-shaped, and hollow, having all their sides inclined inwards towards the under side, are to be laid transversely, and the timber is to pass longitudinally through the centre, and to be secured by wedges of iron and wood. The sleepers are to be six inches apart, and the timber of such a thickness as to prevent any perceptible deflexion betwixt the rails. The road is to be ballasted up to the top of the sleeper, and the timber to stand out sufficiently, and to have any approved rail laid upon it.

Mr. Stephenson considered the plan too expensive.—Mr. Donkin observed that a certain portion of elasticity was beneficial.—Mr. Vignolles said it appeared to him to be Mr. Reynolds's plan cut in pieces.

Machine for raising Water by an Hydraulic Belt, by Mr. Hall.

In this machine, an endless double woollen band, passing over a roller at the surface of the earth, or at the level to which the water is to be raised, and under a roller at the lower level, or in the water, is driven with a velocity of not less than 1000 feet per minute. The water contained betwixt the two surfaces of the band is carried up on one side and discharged at the top roller by the pressure of the band on the roller, and by centrifugal force. This method has been in practice for some time in raising water from a well 140 feet deep in Portman Market, and produces an effect equal to 75 per cent. of the power expended, which is 15 per cent. above that of ordinary pumps. This method would be exceedingly convenient in deep shafts, as the only limit is the length of the band, and many different lifts may be provided.

Mr. Hawkins had seen a machine very similar, fifty years ago.—Mr. Donkin, without entering on the question of originality, stated that he had seen a machine of this description working with a beneficial effect of 75 per cent., the beneficial effect of ordinary pumps being about 60 per cent.

On Cliff's Dry Gas Meter, by Mr. Samuda.

This instrument consists of a pulse glass, that is, two thin glass globes united by a tube. These globes are partially filled with alcohol, and hermetically sealed when all the air is expelled from their interior. In this state, the application of a very slight degree of heat to one of the globes will cause the alcohol to rise into the other. The pulse glass is fixed on an axis, having a balance weight projected from it, and the axis works in bearings on the sides of a chamber through which the gas to be measured is made to pass the gasometer in two currents, one of which is heated and the other cold. The hot gas is made to enter opposite to, and to blow upon the top globe of the pulse glass, while the cold gas blows upon the other. The difference of temperature thus established between the globes causes the alcohol to rise into the upper one, and the glass turns over on its axis, thus varying its position, and bringing the full globe opposite to the hot stream of gas. This stream, with the assistance of the cold gas, which condenses the vapour in the top globe, repeats the operation, and the speed at which the globes oscillate will be precisely in proportion to the quantity of gas which has been blown upon them, provided a uniform difference of temperature is always maintained between the two streams of gas. The difference of temperature is established and rendered uniform by a small flame of gas, which heats a chamber through which the lower current of gas has to pass, and the arrangements for securing an equality in the difference of temperature are very ingenious. The instrument is first tested by making a given quantity of gas pass through it, and observing the number of oscillations of the pulse glass. This once established, the instrument registers the quantity passed with inconceivable accuracy.

Considerable discussion ensued, during which many objections were raised, to which Mr. Samuda replied.—Mr. Liddell observed, during the progress of the discussion, that a flame consuming one-fifth of a cubic foot of gas per hour would burn in a chamber, and not be liable to be extinguished by the opening and shutting of doors; and that if due precaution were used, a flame might be preserved with a consumption only of one-eighth or one-tenth of a foot per hour.

On the construction of Geological Models, by Thomas Sopwith.

Mr. Sopwith lays down a method by which the commonest workman can make geological models, showing not only the position and thickness of the strata in a vertical section, but the actual surfaces and imbedding of the strata lying in different planes; so that one tray of the model being taken from above the other, we may consider that we have the stratum in minature, with every undulation and indentation upon it. There was exhibited a model of the Forest of Dean, constructed in the following manner. The plan of the district was divided by lines crossing each other at right angles, and at the distance of a mile from each other. A vertical section was then prepared corresponding with each of these lines. These sections were drawn upon thin pieces of wood in the ordinary manner of a vertical geological section, and the several pieces of wood were then united by being half-lapped together, forming a skeleton model of vertical sections. After being thus united, the several sections were taken separately, and cut into as many portions as were required to illustrate the successive layers of strata; the intersection of each of these portions having been first marked by a number at the several corners. After each section has been divided into its several parts, these respective portions are again united, and formed the exterior boundary of a square mile of rocks. The interior of this is filled with wood, and carved so as to coincide with the sections. Any intermediate portion can be fitted in with great exactness, first by a thin or skeleton section, and afterwards by wood, which any workman can carve with the most exact accuracy as quickly and as surely as any ordinary mechanical operation; and thus at once a connexion between the most complicated section and the art of a common workman is accomplished. The outline of the surface, and the general contour of the country is obtained, partly by means of the skeleton sections, and partly by the use of a gauge, or graduated pencil, sliding in a frame, in the same manner as practised by sculptors in transferring the dimensions of a cast to a block of marble.

Description of an improved Levelling Stave, for Subterraneous as well as Surface Levelling, by Thomas Sopwith.

The method of reading the figures of the stave itself, instead of the sliding vane, as adopted by most experienced engineers and surveyors, is used in Mr. Sopwith's improved staves. The figures are engraved on copper-plate, on an enlarged scale, so as to contract in drying to their proper length, which is fixed by a very accurate gauge. The arrangement of the scale is that of feet, divided into hundredth parts, alternately black and white; and in the form of the figures, clearness and distinct vision at a distance are chiefly aimed at. Mr. Sopwith's improvement consists in the mechanical arrangement of the slides, which are held in any fixed position by means of a catch or spring. The stave for mining purposes has also an entirely new arrangement. It has a glass shield or cover to protect the face of it from wet and dirt; and is hinged, so as to work in any seam of from three to five feet; but the principle may be adopted for any greater or less extent.

On a Suspension Bridge over the Avon, Twerton, by T. Motley.

The peculiar feature of this bridge, is, that each chain is attached to the roadway, and the suspending bars are carried up through each chain above it. The length of the bridge is 230 feet, the breadth 14 feet, and the cost, including the towers and land abutments, under £2,400. This bridge is superior to the common suspension bridge, in that it is more firm, and experiences much less friction, owing to the absence of vibration.—*Vide Journal, No. 10, page 253.*

Models were exhibited and partially explained of a suspension bridge of wire, erected over the river Avon, near Bath, by Mr. Dredge. The bridge is upwards of 230 feet in length, the breadth of the roadway is fourteen feet, and the whole, including land abutments, &c., was completed for less then £2,400.

A method of Pumping Water from Leaky Vessels at Sea, by Mr. Dalziell.

The machine is worked with a piston, the motion of the vessel being given by the stream when the vessel is sailing, to paddle wheels on the sides.

An instrument for Measuring Timber, by J. Smith.
A peculiar Combination for the Wheel Work of a Crane, by W. Horner.
A peculiar form of Steam Engine Boiler, in use at the Glass Works at Gateshead, by J. Price.

The principal advantages of this boiler were said to be, the impossibility of collapsing, the rapidity with which it generates steam, and the small consumption of fuel.

Professor Willis described his instrument, called the *Odontograph* (vide Journal, No. 9, page 229). He also described the construction and use of some scales of measurement, invented by Mr. Holtzapffell (vide Journal, No. 8, page 186).

On Improvements in Ship Building, by Mr. Lang.

Mr. Lang described and exhibited some models, illustrative of the safety keel, which had been introduced with great success; and mentioned instances in which vessels fitted with these keels had struck and come off without sustaining material injury. He then entered into some details respecting the proper construction of merchantmen, and exhibited some models of the bottoms of merchantmen. He also exhibited a method of securing a round headed rudder, and a model of a tube scuttle to admit light between decks, and which had been used with great success.

On the use of Wire Ropes in deep Mines, by Count Augustus Breunner.

There had been introduced into the silver mines of the Hartz Mountains, about seven years ago, ropes composed of twisted iron wire, as a substitute for the flat ropes previously in use. Since that time they have been adopted throughout the mines of Hungary and most of those in the Austrian dominions, to the almost total exclusion of flat and round ropes made of hemp. These iron ropes are of equal strength with a hempen rope of four times the weight. One has been in use upwards of two years without any perceptible wear, whereas a flat rope performing similar work would not have lasted much more than a single year. The diameter of the largest rope in ordinary use in the deepest mines of Austria, is one inch and a half. This rope is composed of iron wires, each *two* lines in diameter; *five* of these are braided together into strands, and *three* of these strands are twisted tightly into a rope. Great care is requisite in making the rope that the ends of the wires be set deep in the interior of the rope, and that no two ends meet near the same part. The strength of these ropes is little less than that of a solid iron bar of the same diameter. The usual weight lifted is 1000lb. The rope on leaving the shaft must be received on a cylinder of not less than eight feet diameter, and be kept well coated with tar. There is a saving of about one-third of the power in one case mentioned, for *four* horses with a wire rope are doing the same work as *six* horses with a flat rope. It was suggested by the distinguished foreigner, that the introduction of iron ropes for the flat ropes in our deep mines and coal-pits would be attended with the same, if not greater advantages, than has attended their introduction into the mines of the Austrian dominions.

On Steam Navigation and a self-recording Steam Journal, by Dr. Lardner.

Dr. Lardner said, no one could be more deeply impressed with the importance of the observations which had just fallen from the President than he was; and there was not any member of the Association more willing to admit the error into which he had fallen than he should be found to be. It was, however, a matter of no real importance how far any opinion which he might have formerly expressed on extended steam navigation was right or wrong, except so far as it had been made a personal question. The subject was first broached at the Bristol meeting of the British Association, when a discussion arose upon it, and he then remarked, that it was a great experiment which had not yet been attended with any satisfactory result. Unquestionably, he did express a discouraging or unfavourable opinion as far as regarded the probability of ever maintaining an unbroken intercourse by means of steam navigation between Great Britain and New York. But he had been charged with declaring that the transit by steam navigation between Great Britain and New York was a physical impossibility. He never had given expression to such a statement, or to anything equivalent to it; and, as a proof, he read a passage from the article on Steam Navigation, which appeared in the *Edinburgh Review* soon after the Bristol meeting, and which expressed the opinions he then held. He must, however, now acknowledge that the success of the Great Western steam-ship had shaken the opinions he then entertained, and should the same success continue throughout the various seasons of the year, he would be the first to come forward and acknowledge himself completely in error. Dr. Lardner then proceeded to the proper subject before the Section, namely, the duty of marine engines, for ascertaining which a sum of money had been last year granted by the Association. He had been in communication with many steam navigation companies, and found that it would be a hopeless task to attempt to get the men on board the vessels to register with accuracy all the various facts required to be registered. He had consequently considered how this might be done by machinery, and the result was the construction of the instrument before them, and which he termed a steam journal (vide Journal, No. 7, page 167).

On Steam Navigation, by Mr. J. S. Russell.

The object of this communication was to endeavour to point out the means which might be attempted, with the greatest probability of success, for improving steam navigation. It was of importance to consider whether they should look to some new, and as yet untried method, or to improved combinations of the means already in common use. The latter was the better course; and these improvements might be in the vessel itself, in the machinery, or in the nature and application of the fuel. Mr. Russell then adverted to the fallacy of maintaining, as some persons did, that the form of the vessel was alone to be considered, while others held the directly contrary opinion, that an increase of power alone was to be considered. Mr. Russell, however, considered, that in the present state of steam navigation, the opinions of the former were most to be attended to. With reference to these questions, two great experiments had, he said, been made. Two fifty horse power engines had been taken out of a vessel, and two sixty horse power engines put in their place. When the propelling power was two fifties, the velocity of the vessel was ten miles and three quarters per hour. When it was two sixties, the velocity with which the vessel moved was ten miles and six-tenths per hour. Here then was an increase of power, a greater expenditure of fuel, and the increase of the velocity was only three-tenths of a mile. Another experiment was made on two vessels, one of 450 tons, and the other of 500 tons burthen. The larger vessel was propelled by two engines of 300 horse power, and the smaller one by two of 150 horse power. The larger vessel, with the double power, proceeded at the rate of nine miles and a half an hour, whilst the smaller one moved at the rate of nine miles and a quarter an hour. This instance he thought extremely satisfactory; the smaller vessel had the proper form that a vessel should have, and the larger one had not. He was, therefore, of opinion, that the form of the vessel was the direction in which we should look for improvement. Indeed, he thought it probable, that ere long we should have vessels of double the length, for a given breadth, that they at present generally are. The objection to an increased length, from the danger of what is called "breaking the back," might be in a great measure removed by a proper system of diagonal framing. Another important consideration is, that the linear dimensions of a vessel being doubled, the capacity is increased eightfold, but the increase in the resistance need not be more than twofold.

Mr. Russell at a subsequent meeting recalled attention to the following points—that, by doubling the three dimensions of the vessel, eight times the space, at an expense of only double the power, might be obtained—that the form of the vessel must be especially attended to—and that the objections on account of sharpness, which were applicable to sailing vessels, do not apply to steam vessels. He insisted on the propriety of making steamers sharp. Nautical men had great objections to extremely sharp vessels, and preferred full bows. He did not wish to do away with the fulness, but to leave the fulness in its proper part, and add a sharp prow to full bows. By this means, great advantages might be obtained in the proper stowage of the cargo, and proportioning of the load. Breadth and fulness in the centre are absolutely indispensable, and this can only be obtained by lengthening out the extremities. Mr. Russell next proceeded to the subject of power, especially with reference to that of the boilers, which depends on the surface. The points especially to be attended to are, extent of surface, thickness and quality of material, and modes of strengthening. Iron boilers, with copper tubes, possessed considerable advantages; the form of boilers is of little consequence, provided extent of surface be obtained.

On Riveting Boiler Plates by Machinery, by W. Fairbairne.

Mr. Fairbairne described the machinery which he had invented for making boilers. By this machine two men and two boys can fix eight rivets three-quarter inch diameter per minute, or nearly 500 per hour, whereas, by the ordinary operation, with an additional man, not more than forty can be inserted; thus the advantage is as about 120 to one, besides the saving of one man. By this machine an ordinary locomotive boiler, ten feet six inches by one foot diameter, can be riveted, and the plates fitted in *four* hours; whereas the time required, besides extra hands, without this machine, would be *twenty* hours. The work is also much superior. The rivets being hot, the holes are completely filled, and the rivet by its contraction draws the plates so closely together, that the joints are perfect. On testing a high pressure boiler made by this machine to 200lbs. on the square inch, there was no leakage; but in a boiler made by hand, very many of the rivets would be found to leak.

On the Construction of Timber Viaducts, by B. Green.

The timber viaducts constructed by Mr. Green, on several lines of railway, consist of arches on stone piers. These arches consist of three ribs, and every rib is put together with three-inch deck deals, in length of from twenty to forty-five feet, and two of the deals in width. The first course is composed of two whole deals in width, and the next of one whole and two half deals, and so on alternately until the rib is formed. Each rib consists of sixteen deals in height or thickness, their ends making joints, so that no two of the horizontal or radiating joints shall come together. The three ribs are connected together by diagonal braces and iron bolts; the spandrells are strutted in a peculiar manner: the whole of the timber was subjected to Kyan's process, and between every deal is a layer of brown paper dipped in tar. The same principle of constructing arches of iron by laminated plates, has been adopted by Mr. Green. Wrought iron bars from one and a half to four inches square (according to the span of the arch), from fifteen to twenty-five feet long, grooved on the under and tongued on the upper side, are laid one over the other and bent over a centre, until the rib is formed. The iron bars are bound together at intervals of from four to six feet apart, with iron straps and keys round the rib. The spandrells are fitted with iron struts. A considerable saving of expense and great lightness, as compared with stone or ordinary iron bridges, may thus be attained.

On an improved method of Working the Valves of a Locomotive Engine.

Professor Willis described the method recently introduced by Mr. Hawthorn, for working the valves of a locomotive without the usual eccentrics. The motion is derived at once from the connecting rod, by means of a pin placed at the centre of the connecting rod, and giving to a frame a reciprocating

motion in a vertical direction, at every revolution of the crank. To this frame are attached arms, by which motion is communicated to the slides. It is necessary that the slide should be open for the admission of the steam into the cylinder, a little *before* the piston has completed the stroke; this, which is technically termed the *lead* of the slide, must be provided for with great care, so as to correspond with the various speeds of the piston; this arrangement cannot be made where eccentrics are used without considerable difficulty, but this is provided for in Mr. Hawthorn's method, by simply changing the angle at which the frame is set—an operation which can be performed by adjusting a screw.

On Methods of Filtering Water, by J. T. Hawkins.

In this paper the author detailed the various essentials for a durable and simple filter for obtaining pure water. The charcoal must be perfectly well burnt, and kept from exposure to the atmosphere; a test of good charcoal is, that when pulverized it sinks rapidly in water. The charcoal must be supported on an indestructible material, as a plate of burnt clay perforated with holes. The filter may consist of a common gardenpot, or similar vessel with holes at the bottom. The lower part may be filled with round pebbles, then some smaller pebbles, then some coarse sand, and finally a stratum of pounded charcoal, of about three or four inches in thickness. It is a great mistake to put any material, as sand, above the charcoal, with the view of arresting the grosser particles of impurity, as the sand will quickly stop up and be impervious to water. A filter thus prepared will render water perfectly clear and sweet for many years.

On the Effect of Sea and River Water on Iron, by Mr. R. Mallet.

Mr. Mallet stated, that he and Professor E. Davy had, at the request of the Chemical Section, been associated in a series of experiments on the action of sea and river water on iron. They had come to results of great importance to the civil engineer, some of which he would mention. They found that pure oxygen and pure water are both neutral bodies in regard to iron, and only act on it together; that the larger the quantity of uncombined or suspended carbon in cast iron, the more is it acted on by these agents, so much so, that soft Scotch or Irish cast iron may be used to protect grey or chilled cast iron from all corrosion. With respect to the protection of iron by electro-chemical agency, zinc will only protect iron for a time; the oxide of zinc becomes tranferred to the surface of the iron, when all protection is at end. Brass, as proposed by Mr. Hartley, will not protect iron, and he showed some specimens brought from the Liverpool Docks, in which the corrosion had clearly been promoted by the adoption of this method.

The Secretary read the following titles of communications received:—Mr. Reed, *On an improved Safety Hook and Bow for Coal Pits.* Mr. Glynn, *On the Waterworks of Newcastle.* Mr. Wake, *On a new Paddle Wheel.* Sir Charles Monteith, Bart., *On a new Tram-road*; also, *On an improved Kitchen Grate.* Mr. Fourness, *On Coal Mine Ventilation.* Mr. Dobson, *On a method of making Bricks of every required Colour.*

Durham Junction Railway.—The committee attended the procession for opening the railway, on Friday, August 31st. The object of most interest was the "*Victoria Bridge*"—the entire length of which is 270 yards, and its width, within the parapet walls, 21 feet. There is a double line of railway over the bridge, with a flagged causeway for foot passengers. According to the Newcastle Journal, the arch over the river Wear is 160 feet span; from the foundation of the pier to the spring of this arch is 72 feet; from the springing to the crown of the arch the distance is also 72 feet; and from the crown of the arch to the parapet wall, is 13 feet, making in all 157 feet. From this, to obtain the height for the ordinary water level, we must deduct the solid masonry buried beneath the waves, which makes the observable walling 130 feet. This is considerably higher than the celebrated Sunderland Bridge, and (as Mr. Ingham, the chairman at the banquet observed), taken as regards *height* and *span*, is the largest arch in Europe. True it is that the arch of the bridge over the river Dee, near the city of Chester, is wider, and the Spanish bridge at Alcantara, near Lisbon, is more lofty; but, taking into consideration the united difficulties of extent of span, and height from the water level, the "Victoria Bridge" must stand unrivalled.

REVIEWS.

Continued from page 336.

A Series of Lithographic Drawings on the London and Birmingham Railway, by John C. Bourne; *with Topographical and Descriptive Accounts of the Origin, Progress, and general Execution of that great National Work, by* John Britton, F.S.A., &c. Part 1, *with Eight Drawings.*

We have received several specimen-plates of this highly interesting publication, which are executed in the first style of lithographic art. Each drawing portrays the construction of the works on different parts of the railway, and at the same time it shows the manner of executing them, the artist having very happily hit upon each view at the identical moment of greatest interest; for instance, in the sketch of the entrance to the Watford tunnel, the men appear to be engaged in fixing an iron brestsummer of great length over the archway, which we presume is for the purpose of tying in the stone-work, to prevent the superincumbent weight forcing it out. This mode of construction might escape the vigilant eye of the most skilful engineer, if he had not been present at the time of executing the work. Another drawing shows the method of forming embankments from side-cuttings; and another, the construction of the iron bridge over the Regent's Canal, Camden Town. We shall hereafter notice this work more minutely; in the mean time we hope the first part, containing eight drawings, will meet with that encouragement from all parties connected with railways, as to induce the artist to continue his labour on some other similar undertaking.

Plan of Trafalgar Square, and Site of the Ground for the proposed Nelson Monument, measured and drawn by H. Courtney, Surveyor.

This plan is indispensable to every architect and artist who intend to compete for the premium. We very cheerfully recommend it to them, as likely to save both their time and expense. A section of the levels, both longitudinally and transversely across the square, is also given; likewise the height of the portico to the National Gallery.

Suggested Site for the Equestrian Statue of his Grace the Duke of Wellington.

We have received a lithographic drawing of a design for the Wellington Testimonial, by Mr. Wallace, which is fully explained in the description accompanying it, and which we transcribe to our columns for the information of our architectural friends.

It is manifest to most persons of taste and observation, that in the formation of the entrance to St. James's Park from Waterloo Place, an opportunity such as does not often present itself, of producing an effect truly classical and imposing, has been entirely overlooked. With such elements as a flight of steps 70 feet in length, and a rise in level of 15, something very different from the present bald and insipid appearance must have been produced, had not the carrying into effect the afterthought of an entrance here been governed by considerations of utility and economy alone. The situation is admirably adapted for a portal, in the style of the Athenian propylea: and though the erection of the Duke of York's Column has for ever barred the erection of such a feature, much may still be done to ennoble and dignify the place, and render it more worthy of the name it bears, or should bear, "the Waterloo Gate." The public voice seems generally to condemn the idea of placing the equestrian statue of the Duke of Wellington across the arch into the Green Park, as a solecism in taste; and another situation, it is presumed, will be sought for.

The centre of the opening for the Waterloo steps, on the Park side, is one which, from its peculiar nature, is better adapted, perhaps, for a pedestal and statue of heroic dimensions, than any other that could be pointed out. Why should not the proposed "Testimonial" be here? The proximity of the Duke of York's Column on the higher level is any thing but an objection. So far from injuring, the two objects would admirably harmonize with, and assist each other, both with regard to grouping and association, and with the aid of a few suitable accessories, the entire locale would assume a majestic and trophied character, indicative of military glory and achievement.

An attempt has been made to illustrate these ideas in the accompanying lithograph. The cornice or surbase of the pedestal on which the statue of the Duke is placed, being made to range with that of the column on the upper platform, is at the height of fully 30 feet from the ground, which, with the blocking and plinth over, would dictate a height of something like 20 for the statue, and give a total altitude of about 54—dimensions which, colossal as they are, would seem by no means extravagant, taken in relation to the lofty façades of Carlton Terrace, and the open area of the Park.

It is suggested that the pedestal should be of red granite, polished from the top of the base upwards, the front face having a figure of Victory, in basso relievo, and perhaps other emblems or inscriptions, might be sparingly wrought on the remainining faces. Such a pedestal, it is presumed, would in itself be a majestic and noble object, imposing from its simplicity and magnitude, and not unworthy the renown of the illustrious individual whose effigy it would bear. The dark tint upon the statue implies that it should be of the most noble and least perishable of materials—bronze. The removal of a few adjacent trees (required even under present circumstances) would open up a view of the statue from the Horse Guards and Treasury across the Parade, and with especial reference to the Duke's military career, the glory of which acts as a dissolvent of all political and party feeling, no spot, it is confidently submitted, can be selected more appropriate.

LAW PROCEEDINGS.

DIVERSION OF ROADS BY RAILWAYS.

We understand that the question of how far the Grand Junction Railway proprietors are authorised, by their act of Parliament, to divert roads, is likely to be decided, ere long, in a court of justice. It appears that in the neighbourhood of Perry the proprietors, in their usual cool manner, have stopped up a road, and, instead of making another convenient one, either over or under the railway, they have diverted it a considerable distance, by the side of the railway, into the turnpike road, and absolutely obliged the passengers on a bye-road to pass through a turnpike gate. The surveyor of the roads determined to assert his rights, by passing over the railway. For doing this

he was summoned before Captain Devy. Mr. Swift, solicitor to the company, attended, and the magistrate felt bound to convict in the mitigated penalty of 1*l.* The surveyor was not satisfied with the decision of one magistrate, and crossed the railway again. The case was, a second time, heard by Lord Dartmouth and Captain Devy, and the magistrates both held the opinion that they were bound to convict. The consequence of these two decisions will probably be the indictment of the Grand Junction Railway Company for illegally stopping up an ancient highway. It is a question of much importance to the public, as there are many other cases where the railway company have stopped up roads, much to the annoyance of persons residing in their neighbourhood, and, apparently, without any just right so to do.—*Birmingham Advertiser.*

LAND TAX ON RAILWAYS.

On Tuesday, the 4th ultimo, an important appeal came on for hearing at Hoo Green, before the Commissioners of Land Tax for the Bucklow Hundred; present W. T. Egerton, Esq., M.P., Edward Jeremiah Lloyd, and James Heath Leigh, Esqrs. Mr. Swift, solicitor, Liverpool, on behalf of the Grand Junction Railway Company, appealed against the land tax assessed upon the railway, in the townships of Walton, Duddon, Preston, Moore, Keckwick, Aston, and Acton, amounting altogether to 142*l.* per annum. Mr. Thomas Barker, Northwich, and Mr. Nicholson, of Leeds, appeared on behalf of the townships, to support the assessments; and the question to be decided was, the liability, or the non-liability, of the railway to the land tax at its improved value. After a long and patient hearing, and perusal of several acts of Parliament, and opinions of eminent barristers, the chairman delivered the opinion of the court, and declared the railway liable to be assessed to the said land tax at its improved value.—*Macclesfield Courier.*

RAILWAY COMPENSATION.

TARBUCK *v.* THE BLACKWALL RAILWAY COMPANY.

In the Sheriff's Court, on Saturday, 22nd ultimo, a case was tried which involved a point of considerable interest. The plaintiff claimed the sum of 455*l.*, the value of two houses belonging to him, and the sum of 120*l.*, for the anticipated injury that would be done to two other houses belonging to him, and which would be deteriorated by the works of the railway. The defendents offered 320*l.*, in satisfaction of the former claim, and denied the right of the plaintiff to compensation for any prospective damage. On evidence being tendered to prove the latter claim, Mr. Hill, for the defendants, objected to its being received, on the ground that no action could lie for damages that might accrue in future; in furtherance of this opinion he cited several cases in point. Mr. Jones, for the plaintiff, contended that he had a right to compensation now. The under-sheriff decided that the right to call for damages for an anticipated injury did not exist, and that when the injury accrued the plaintiff had his remedy at law. After hearing evidence as to the value of the property, the jury returned a verdict—Damages, 360*l.*

STEAM NAVIGATION.

Brazilian Steam Packet Company.—The launch of the Pernambucana, the fourth vessel for the service of this company, took place on the 6th ultimo, from Mr. Thomas Royden's yard, in Baffin-street, and the fifth and last boat for this undertaking will soon be completed.—*Liverpool Mail.*

The Gorgon Steam Frigate.—Commodore Dacres, arrived here yesterday from the Nore, with a Spanish brig in tow, which had run foul of her on her passage, but without material damage to either vessel. The arrival of this ship has excited much attention, as she is the largest Government steamer, being 1,140 tons. She mounts two 84 pounders bow and stern, on sweep slides, and six 32-pounders, long guns, on the broad side, all on the upper deck; but as on the deck below we find five ports on each side fitted with ring bolts and breeching bolts, we would ask why she has not guns mounted there? Is it that she is deeper in the water than was calculated on? because we have heard as much; and from the fact, that the lower half of the ports in question are caulked in, because they are very near the water, that the copper has been raised a streak, and her lower paddle boards are immersed four feet under the surface. Such would appear to be the case. At present her draught is 15ft. 6in forward, and 15ft. 10in. abaft; her stowage is for 500 tons of coals; but she only took in this voyage 350 tons—barely, we understand, a 10 days' consumption. She has had no coals stowed in her after boxes, and her spare heavy pieces of machinery are stowed forward, instead of the place originally intended. She has a deck below the presumed gun-deck, where 400 troops could be comfortably berthed at a time; her two engines comprise a strength of 320 horse-power, and appear of beautiful construction; her boilers are of copper. She will sail in a few days with a detachment of Marines, and supplies of provisions, for San Sebastian. We would ask any shipwright or seaman the reason why she has such an extraordinary sheer or spring in the fore part of her upper deck, and which it was remarked by visiters, must materially inconvenience the working of the foremost gun.—*Hampshire Telegraph.*

Egypt is fast becoming of moment in the opinion of other nations. Five years ago there was not a single steam-vessel of any nation plying from Egypt; now, those of England, France, Austria, and Egypt, number 18 regular opportunities to and fro every month from Alexandria. When will our government build the "Great Eastern," of 1500 tons. to go direct (both ways) between Plymouth and Alexandria in 15 days, with India mails and passengers, and thus keep the French and Austrian lines from our Indian correspondence. I shall visit Canton *via* Calcutta, and see if sufficient interest and capital cannot be realised there for the extension of Indian steam navigation to China.—*Extract of a Letter from Mr. Waghorn.*

Atlantic Steam Navigation.—A powerful steam-vessel to and from New York is to be placed on the Shannon, whereby facilities can be afforded for crossing the Atlantic, much greater than at, any English port in a given time.—*Limerick Chronicle.*

Dr. Davidge, of Saratoga, has invented a steam-boat for canal navigation, in which flexible floats or paddles, operating beneath the water, are substituted for wheels.

Iron Steamers for the Nile.—The iron steamers destined to ply on the river Nile are at present building at Greenock. The models are of the most approved description, and when ready for plying will draw from 22 to 24 inches of water. A neat handsome steamer, named the Hope, built and fitted out at Greenock, is to sail some of these days from Greenock for the Cape, where she is to run as a constant trader and packet. Almost every quarter of the globe have Clyde-built steamers plying on their rivers.—*Glasgow Chronicle.*

Another enormous Steam Ship.—Messrs. Curling and Young, of Limehouse, the builders of the British Queen, have begun a steam-ship of 2,000 tons; being 400 tons more than the British Queen; she is not to be so long as that vessel, but much wider.—*Mining Journal.*

The Great Western Steam Ship Company are about to build another vessel, of equal size to the Great Western, and she will be called the City of New York. A large cargo of African oak timber has been purchased by the company for this and other ships. The Great Western is to sail from Bristol the 27th of this month, on her fifth voyage to New York.

We understand that Government has decided on establishing a line of steam-packets between this country and Halifax, Nova Scotia, and that the contract will be thrown open for public competition. We need not point out the advantage to commercial communications which will result.

The St. George Steam Packet Company's steam-ship Sirius left London on Saturday, the 1st ultimo, and arrived at St. Petersburgh on Sunday, the 9th, left Cronstadt on Sunday, the 16th, and arrived off the London Docks Sunday afternoon, the 23rd ultimo, having performed the outward voyage in eight, and the homeward in seven days, including considerable detention both ways at the Sound.

The Royal William left Liverpool on the 21st ultimo for her second voyage to New York. She had on board 67 cabin passengers. The amount of fares for passengers, freight, cargo, parcels, and letters, considerably exceeded 3,000*l.* She carries also with her 40 tons of the new scientific and useful invention, for which Mr. C. W. Williams, the able and enterprising manager of the City of Dublin Steam Packet Company, has lately obtained a patent. From the circumstance of each ton of this discovery being able to do the work of three of the common coal, the proprietors of the vessel have been enabled this voyage to take 50 tons of cargo, with the full complement of passengers.

DESCRIPTION OF FUEL.

	Tons.	Cwt.	Qr.	Lb.
Coal - - - - - - -	310	11	1	—
Peat stone fuel - - - - - -	52	1	—	7
Total - - -	362	13	1	7

DRAUGHT OF WATER AT STARTING.

	Feet.	Inches.
Lighter than on previous voyage - - - - -	0	6
Forward - - - - - - - - - -	13	11
Aft - - - - - - - - - - -	11	4

—*Liverpool paper*

Prevention of Smoke from Steam Ships.—Mr Ivison's apparatus is now being applied to the furnaces of the Royal Adelaide steam-ship, preparatory to her sailing to day for London. The enterprizing proprietors of this vessel, the London, Leith, Edinburgh, and Glasgow Shipping Company, deserve great credit for having been the first to introduce this improvement to steam-ships, and the result of its application on this voyage will be looked forward to with considerable interest, not only as to its effects in entirely consuming the smoke, but in the more important one to the proprietors—the economizing of fuel. During the last ten days great numbers of engineers, manufacturers, and men of science, from different parts of the country, have visited the silk mills to witness the apparatus in full operation, and one and all of them have expressed themselves highly pleased with its efficiency.—*Edinburgh Evening Post.*

OPENING OF THE LONDON AND BIRMINGHAM RAILWAY.

The directors resident in London, attended by a few of their friends and proprietors, together with their principal officers, proceeded by a special train from the Euston station on Monday morning, the 17th ult., at a quarter past 7 o'clock. The distance from London to Birmingham (112½ miles) was accomplished in the short space of 4 hours and 39 minutes, including stoppages. The train, which (as we before observed) left at a quarter past 7 o'clock, arrived at the Harrow station at 27 minutes past seven, a distance of 11¼ miles; at Watford, a distance of 17½ miles, at 39½ minutes past 7; at Boxmoor, 24 miles, 6 minutes before 8; Berkhamstead, 28 miles, 8 o'clock precisely; Tring, 31¾ miles, 9 minutes past 8, and left that station at 25 minutes to 9; Leighton, 40 miles, 10 minutes before 9; Denbigh Hall, 47¾ miles, 5 minutes past 9; Wolverton, 52 miles, 17 minutes past 9; Rugby, 83 miles, 11 o'clock; and after passing through Coventry, arrived at Birmingham at 4 minutes past 12 o'clock.

It will be in the recollection of most of our readers, that the act of Parliament for this work was obtained in 1833, after considerable opposition, occasioned solely by this mode of travelling being then so little known and understood. The works were commenced in June, 1834, and proceeded as expeditiously as the extreme difficulty and nature of them would admit. The whole line had been projected by Mr. R. Stephenson, whose talents as an engineer are too well known to the public to require any further comment on them. The directors having had the greatest confidence in him, immediately placed this important work under his able management, and the result has fully realized their most sanguine expectations. A portion of the line, from London to Denbigh-hall, was opened in the autumn of 1837, and another portion, between Birmingham and Rugby (a distance of 21 miles), was opened in April last. The line between Rugby and Denbigh-hall presented the greatest difficulties of construction—we allude to the deep cutting called the "Blisworth cutting, which, though not the largest work of the description on the line, has, from the character of the material, been by far the most expensive and arduous. The Tring cutting contains a greater cubic content, but this material being entirely chalk, less difficulty was experienced in the execution than in the Blisworth, which consists chiefly of hard blue limestone, belonging chiefly to the volitic series of rocks, and which yielded throughout all seasons large quantities of water, which it was necessary to drain by pumping. The working of the rock in this cutting was rendered more

difficult and tedious than it otherwise would have been by the strata of rock being interstratified by these beds of blue shale, which, being impervious to water, rendered every means of drawing off (except that of pumping) unavailable. The Blisworth excavation contains 1,200,000 cubic yards, averaging 50 feet deep, for two miles in length. About 400,000 have been removed from each end to form adjoining embankments, which reach the height of 45 feet at the highest point. The remaining 400,000 have been raised up the steep side of the excavation, and deposited on the adjoining lands, forming what are termed spoil banks. The cost of this work has been 200,000*l*., and is believed to be the largest excavation of the kind ever executed.

The Kilsby-hill was, if possible, more formidable than the last mentioned work, for while the proceedings were impeded by bad material and enormous quantities of water, the means for overcoming them were confined within the narrow limits of a tunnel. Shortly after the shafts and preliminary works were organized, an extensive quicksand was discovered, which made it apparent that additional means, beyond those already contemplated, were requisite. Extra shafts were sunk, and four powerful pumping engines were erected, which continued to pump from the quicksand for six months, with scarcely a day's intermission, at the rate of 1,800 gallons per minute. By these means the difficulty of tunnelling in the sand was reduced, but still the operation was one of extreme difficulty and danger. The tunnel is 2,400 yards in length, or nearly a mile and a half, 25 feet wide, 28 feet high, and is ventilated by two large shafts, each 60 feet in diameter, one 120 feet deep, the other 90 feet. The means of tunnelling thus employed by Mr. Stephenson afforded greater facilities for ventilation going on more perfectly They appear to have answered their object most effectually, for in a few minutes after an engine and train has passed through, the vapour is carried up the shafts, and the tunnel rendered so clear that the other end may be distinctly seen. It has cost upwards of 300,000*l*.—about three times what it would have done had the casualties and difficulties been of an ordinary character. The line of railway has eight tunnels, which are nearly of similar dimensions, and passed through with impunity and without annoyance. The Wolverton viaduct is one of the most important bridges on the line. It is erected over the Ouse and Tow, near Stony Stratford. It consists of six semi-elliptical arches, each 60 feet span. The roadway is elevated 50 feet above the natural surface of the ground. It is (with the exception of the cornice and coping, which are of stone) composed entirely of brick. The aggregate amount of excavation required on the London and Birmingham Railway is about 15,000,000 of cubic yards, being equal to an average of upwards of 120,000 cubic yards per mile. To form an idea of the rapidity of the execution of this work, we may divide the whole period—say four years—by the number of miles, and we actually find that the average rate of progress has been one mile a fortnight since the first commencement of this undertaking.

The entrance of the London terminus, Euston square, is formed by a propyleum (used by the ancient Greeks as the chief entrance to their cities), consisting of four Greek Doric columns, 8 feet 6 inches in diameter, and 42 feet in height, two in front and two in the rear, with antæ at the angles of the building, surmounted by a Doric entablature and pediment; forming, altogether, a height of 72 feet. On either side of the entrance are four lodges, serving as offices for the establishment. The effect of the entrance is most striking, from its magnitude and simplicity of design. Mr. Philip Hardwick is the architect.

The terminus at Birmingham resembles that of London, only possessing greater accommodations for the directors and officers of the company, as well as refreshment rooms for persons travelling by the railway.

Many parts of the works have not yet assumed the finished character of that portion of the railway which has been hitherto in operation, and the rate of speed of the trains will be regulated accordingly. The time occupied by the directors in going down was, of course, less than will be required for the ordinary travelling, in consequence of their not having to stop at the stations; but, allowing six hours for the extreme time of the "mixed" trains, the change which will be effected in the travelling of the whole of the north of Great Britain and Ireland cannot be estimated.—*Times*.

PROGRESS OF RAILWAYS.

Eastern Counties' Railway.—We are much pleased to see this line progressing. Within these few days we have been along the line which is under contract, as far as Romford, and on the entire distance the utmost activity prevails. From Dog-row, near the Mile-end-road, where the temporary terminus is to be, the ground is cleared of the houses and buildings which have hitherto impeded the operations of the company; but we understand that this part will be commenced and finished forthwith. For a considerable distance on the London side of the Regent's Canal, the embankment to carry the railway is in course of formation. A brick and stone bridge of a substantial and handsome design, is nearly completed over the canal; between which and the river Lea the ground is fenced off; and the road bridges, four in number, in course of execution. From the river Lea to Ilford, the *whole* of the brickwork and masonry is finished, with the exception of (in a few instances) the parapets and coping. The embankment over the Stratford marshes will be shortly completed, the permanent rails being already laid on a portion of it, and for a considerable distance in the cutting by Maryland-point. The company have employed, on this part of the line, two powerful locomotive engines in place of horses for drawing the earth-waggons. In the Stratford marshes they have a contrivance to facilitate the tipping of the earth-waggons, which consists of a moveable stage of about 40 feet in length, on which are laid two lines of rails, corresponding to those on the embankment; one end of the stage rests on the embankment, the other end is supported by frame-work on wheels; on this stage the waggons are run, and the contents tipped with great rapidity. The engineer of this line has adopted a five-feet gauge; the rails are parallel, and laid throughout on transverse sleepers of elm, larch, and fir. The brickwork and masonry is generally to be praised. For a considerable distance on the London side of Ilford (where a station is to be made) the permanent rails are also laid. At Ilford the company are proceeding with great spirit, all the houses and buildings being cleared away, and the excavations proceeding rapidly. The works, as far as Romford, are being carried on with the same activity, so that by the time the earth-work between Stratford and within about a mile of Ilford is finished (which alone remains to be done), the line from Ilford to Romford will be completed, so that within a very few months from the present time, the public will be able to avail themselves of this line as far as Romford; and from the immense traffic on the great eastern road, an immediate and profitable return will be made to the shareholders. We understand that Mr. Burge has concluded with the company for a contract extending to the summit of Brentwood Hill (the heaviest work on the line), which will be commenced immediately. Two-thirds of the line to Chelmsford are now under contract.

Blackwall Railway.—Active operations are to be commenced immediately. The contractors have received instructions to proceed with the building of the viaduct, immediately the houses are cleared away, which is expected to be before the middle of the present month.

Glasgow, Paisley, Kilmarnock, and Ayr Railway.—The contracts from Ayr to Kilwinning, beyond the junction with the Ardrossan Railway, being a distance of about sixteen miles, are let in nine lots to respectable contractors for the sum of 65,637*l*. The first eleven miles to Irvine are to be completed by the 1st July, and the remaining five miles by the 1st October, 1839. The whole line is enclosed on each side by a strong wall, 4½ feet high, likewise included in the contracts, which comprise the two very beautiful bridges over the Garnock and Irvine rivers, designed by Mr. John Miller, the company's engineer, as well as several smaller bridges. The remaining portion of the thorough line—namely, from Kilwinning to Johnstone, about 14 miles, is to be immediately contracted for. The engineers are already engaged on the working plans, so that the contracts may be let, and the works commenced before the win er. The expense of this part of the line is not calculated to be very heavy, as the first sixteen miles from Ayr are executed at about 4,000*l*. per mile. If to this be added the purchase of land and the expense of rails and blocks, which altogether will not exceed the same sum, that part of the railway will be opened at an expense of not more than 8,000*l*. per mile—a circumstance almost unprecedented. The Ferguslie and Elderslie contracts, extending from Johnstone to Paisley, will be speedily commenced. The Paisley Contract, being the commencement of the joint line, consisting of an embankment on arches of masonry, comprising several street and road bridges, as well as the bridge over the river Cart, is let to Messrs. Walter and John King, and D. Lyon. The Arklestone and Ibrox contracts are also let, in one lot, to Mr. T. Brassey, on satisfactory terms. The whole of this part of the line is under the direction of Mr. Joseph Locke, ably and zealously seconded by Mr. J. E. Errington, and is to be completed in the spring of 1840. All these contracts are in active progress. The remaining portion of the joint line to King-street, in Tradeston (Glasgow), will be completed by the same period. The directors have thought it so indispensable in every respect to bring the terminus as near as possible to the Glasgow bridge, that they have decided on having this part contracted for without delay, so as to open with the rest of the line in the summer of 1840, and travellers will thus only require to cross the bridge in order to take their seats in the carriages, without the inconvenience of any intermediate passage by omnibus, so burthensome to the public. The width of the rails has been fixed at four feet eight and a half inches, with a view to insure the connexion by the projected great l nes, with the manufacturing distr.cts of the north of England. Engines are already ordered, that no delay may occur after the works are finished. A pattern carriage of each description is to be furnished by one of the best London makers, which is to serve as a model for others that may be ordered here, in order to insure uniformity of accommodation to the public. The contract for 2,000 tons of wrought-iron rails for the Ayrshire end of the railway, is taken by Messrs. Bailey, Brothers, of Liverpool; and that for 750 tons of cast-iron railway chairs, by the St. Rollox Iron Company, Glasgow.

Glasgow, Paisley, and Greenock Railway.—At the beginning of last month, the directors visited all the works along the line, and expressed themselves much gratified at their progress, notwithstanding the late inclement weather. In upwards of 20 places the ground is now covered with gangs of labourers, amounting already to about 900 men, and as rails and waggons are daily arriving, this number will soon be materially increased.

Glasgow, Paisley, and Greenock Railway.—Last month the foundations of the railway bridge that crosses Gilmour-street, Paisley, were laid, and the building has since been proceeding with spirit. The width of the railway at that point was originally intended to be 27 feet, and to contain two lines of rails; but we learn that the directors have come to the resolution of having their depôt in the spare ground adjacent to the County Buildings, and the road will now be 50 feet at the point where it crosses Gilmour-street, and will contain four lines of rails. The choice of a place for a depôt is well made, as there is no other point in the whole passage of the railway through the town where it could have been planted with such regard to general public convenience. A shaft has been sunk about the middle of the tunnel that is to run below Arklestone Hill, and rock found at the depth of about 20 yards. It is expected that rock will be found nearly the whole length of the tunnel, which is about 2.0 feet, at the depth of 60 feet, and that it would prove highly valuable for various purposes in the formation of the railway. Several houses and sheds have been erected at that point, for the use of smiths, sawyers, &c. At that part there are upwards of two hundred men at work, but they are continually on the increase. As soon as the crops are off the ground, it is expected that above 2,000 will be on the line between this and Glasgow. A strong body of men are digging on the east side of Cart, for the foundation of the bridge that spans the river. Every where a great degree of activity is manifested; and it is evident that, even during the present autumn, great progress will be made. —*Paisley Advertiser*.

Edinburgh and Newcastle Railway.—The Lord Mayor, as Chairman of the York and North Midland Railway Company, has received a most important communication from that experienced engineer, George Stephenson, Esq., who is now engaged in laying out a line of railway from Newcastle to Edinburgh, which must be of the greatest importance to the city of York, as it will preserve us in the direct line between the two great metropolitan towns of London and Edinburgh. There has been an attempt made to carry the line on the west side of the kingdom, through Lancashire, but we believe the attempt to obtain anything like a practicable line has been fruitless. Mr. Stephenson says, that he believes he shall be able to get a line from Newcastle to Edinburgh through almost as favourable a country as the York and North Midland, both with regard to levels and expense of construction; and that he has not the slightest doubt that the great thoroughfare from London to Edinburgh will pass through York, as no other line can be found equal to it.—*York Chronicle*.

Dundee and Arbroath Railway.—The facilities for rapid travelling in this district will shortly be much increased by the opening of the railway between this place and Arbroath. We understand that at a meeting of the Directors, held here on Friday last, it was resolved to open one of the rails between Arbroath and Craigie, for passengers, on the 17th ultimo. There is no hope of the work being in full operation, on both lines, before next spring. In the mean time, omnibuses will ply between Dundee and Craigie, about two miles, for the carriage of passengers and their luggage. It is expected that the locomotive engines will perform the journey in 45 minutes.—*Dundee Courier*.

Maryport and Carlisle Railway.—The workmen on this railway lately fell in with a seam of coal near Crosby. They are also working an excellent stone quarry in the same neighbourhood, which was discovered in forming an extensive cut. The engines are ordered, and are expected to be in full operation next year.

Chester and Birkenhead Railway.—We are glad to perceive that this undertaking, which excites great interest on both sides of the Mersey, is progressing rapidly. The contracts for the whole of the line have been taken on terms considerably under prime cost (?), and upwards of 700 men are now at work. Near the turnpike-road, between Brombro' and Rock Ferry, the progress of the road is already visible; and the completion of the whole line may be expected long before the period originally fixed.—*Liverpool Standard.*

Chester and Crewe Railway.—We feel pleasure in being able to announce that the cuttings have commenced on this line of railway, near the Spittal locks, Boughton. About 200 men have been set to work altogether. Matters went on very well until Tuesday last, when the excavators made their appearance *en masse* in Foregate-street, each shouldering the implements of his craft. The cause of this imposing array was the rate of payment, 3d. per cubic foot; and the workmen stated that it was impossible to earn bread and cheese at it. On that evening the whole gang were paid off; and we have been informed, that in very few instances, indeed, had they earned less than 4s. a day each man. Though the contractor did not accede to their demands, yet we are glad to observe that the cuttings are going on with great activity, on a new under-letting.—*Chester Chronicle.*

The Morecambe Bay Scheme.—We understand that Mr. Hague, who has lately surveyed Morecambe Bay, expresses himself fully satisfied that a railway can be easily carried across, and goes so far as to say that if a company will engage to give him half the land reclaimed, he will do the work at his own risk. Of the practicability of the thing we never doubted, but what we doubt is that an act of Parliament will ever be procured. There lies the difficulty, and our present impression is that it is an insurmountable one.—*Lancaster Gazette.* We see no reason why an act of Parliament may not ultimately be obtained for this line. Under present management we hold it next to impossible that the work will ever advance one step after the publication of Mr. Hague's report; but let not the inhabitants of West Cumberland despair, or suppose because Mr. Hague and his employer fail, that the difficulties our contemporary fancies he has discovered are insurmountable.—*Cumberland Pacquet.*

Preston and Wyre Railway.—A trial of the first locomotive engine which has been placed on the Preston and Wyre Railway was made on Thursday last, by Mr. Stevenson, the contractor, accompanied by a number of the most respectable inhabitants of the town and neighbourhood of Poulton. A very great concourse of persons was in attendance, and much interest was excited. Every precaution was taken to prevent accident, and the speed of the engine was at no time allowed to exceed twenty miles per hour. A number of the gentlemen present, who have been much accustomed to railway travelling, expressed themselves exceedingly gratified at the surprising smoothness and facility with which the engine glided along, which is to be attributed to the admirable manner in which the rails are laid. The distance on which the engine can now travel will speedily be increased, as there is a considerable length of the line now ready for the laying of the permanent rails.—*Preston Pilot,* Sept. 4.

Brandling Junction Railway.—The works of the Brandling Junction Railway are so far advanced, that the directors are enabled to fix the opening of the line from Redheugh to Gateshead for the 15th of October; when passengers and merchandise may be conveyed from the Newcastle and Carlisle Railway, to the company's depot on the east of Gateshead; and coals delivered into vessels at the company's drops and quay, at the east end of Hillgate. Between South Shields and Monkwearmouth, the works are also now proceeding with considerable expedition; and it is calculated that that part of the line will be ready for opening by about the 1st of January next. The deep cutting necessary to form the inclined plane on the west side of Gateshead is now finished, the permanent way laid down, the stationary engine-house nearly built, and all the arches of the viaduct over the town closed; and the wooden bridges are also prepared, and ready for putting up across Oakwellgate and West-street. A considerable portion of the quay is also built.—*Newcastle Journal.*

The Railway Delta in Lancashire.—The completion of the Manchester and Bolton Railway has enclosed a considerable tract of country within a triangular boundary of railway lines; of which the base is formed by the Liverpool and Manchester Railway line from its terminus in this town to the Kenyon junction—being a distance of rather more than ten miles. The left or westerly side of the triangle is formed by the Kenyon and Leigh junction line, of which the terminus at Bolton forms one side of the apex; this line is probably about ten miles in length. The Manchester and Bolton Railway forms the right or easterly side of the triangle, and is somewhat the shortest side; its termini are Salford and Bolton. Besides connecting the towns of Bolton and Leigh with Manchester and Salford, this delta includes the towns of Pendleton, Pendlebury, Monton, Worsley, Little Haughton, Clifton, the three Hultons, Kersley, Farnworth, Great Lever, Shakerley, Atherton, Tildesley, Astley, and Pennington. The Duke of Bridgewater's canal enters it at Patricroft, and quits the delta at Leigh. The delta includes a portion of Chat Moss, probably about four miles in length, and of breadth varying from a mile to a quarter of a mile. The principal stream in this tract is the Glazebrook, and the eastern boundary line is skirted by the Manchester, Bolton, and Bury canal. Perhaps no district in the world, of similar size, is equally favoured in the means of both land and water communication more than this little delta, which, once the scene of the triumphs of a Brindley, and the site of one of the earliest canals in England, is now girt and environed with an iron zone—enabling it, like the fabled belt of the fairy tale, to transport its treasures (mineral, manufacturing, and agricultural) in a space of time hitherto inconceivably rapid, to the most distant parts of the kingdom.—*Manchester Guardian.*

Cheltenham and Great Western Railway.—It has been currently reported here that the directors of this undertaking are pressing on the works at different parts of the line with the utmost vigour. We trust this is the case; it will not only satisfy some who may have doubted their intention so to do, but will, we think, act as a talisman with the proprietary in inducing them to pay up their calls.—*Wilts and Gloucestershire Standard.*

Sheffield, Ashton-under-Lyne, and Manchester Railway.—We have pleasure in informing our readers, that several contracts with landowners have already been completed upon the most favourable terms; and that the directors are in treaty with other parties, with every prospect of a similar result. The engineer has also received instructions to proceed immediately with the drift-way through the summet ridge, and other works connected with the tunnel, and that he has also completed the working drawings for a considerable distance of the line.—*Sheffield Mercury.*

The Manchester and Leeds Railway.—Of the great and important lines of railway communication which a few short years will see radiating from this great metropolis of manufactures, perhaps one of the most valuable and important will be that which connects the capital of the cotton with the capital of the woollen manufacture. The line runs in a direction about N.N.E. from this town to Hebden-bridge, whence its course is E.S.E. till within a few miles of Wakefield, at a point nearly due south of Leeds, and from which it makes a detour by Wakefield to the North Midland line, which carries it in a north-westerly direction to Leeds. The Manchester terminus of the line is to be in Lees-street (St. George's-road), near its junction with Oldham road. The heaviest embankment will occur in crossing the river Irk, near a place called Mills-hill, and about three quarters of a mile east of Middleton. Here a long double culvert is carried over the Irk at a height (the rails above the surface of the water) of 65 feet. The embankment does not extend much further. The railway passes over Oldham-road, Rochdale, near the Rochdale Canal Company's station, on a viaduct of sixteen arches, at a height of about fifteen or sixteen feet. The summit tunnel will, of course, be the heaviest piece of work on the whole line. This tunnel will be about a mile and a half in length, passing completely through the hill at the foot of Blackstone Edge, into the valley of Todmorden. This it does at a singularly low level, being only about 545 feet above the level of the sea, and, consequently, much lower than the level of any of the canals passing through this ridge. After leaving the summit tunnel, the line winds along the course of the valley of Todmorden. The line pursues its way till, about two miles east of Wakefield, it enters the North Midland line at a distance of fifty miles from this town; there the line proper may be said to terminate—the North Midland proceeding thence to Leeds, a distance of about ten miles further. The total distance from the Manchester to the Leeds terminus is 60 miles 50 chains, the length in a right line being about 35 miles. The nature of the country, and the necessity of passing what has been called England's vertebral chain, have caused this circuitous route to be necessary. Not only have the contracts been let for all the heavy works on the line, but in most of them very considerable progress has been made. From this town to the summit tunnel, beyond Littleborough, between 3,000 and 4,000 men are at this moment at work. We believe it is intended to have the whole line completed "in all 1840." The line will form one grand connecting link in the great chain of railway communication which is rapidly bringing Manchester into closer communication—we might almost say contact—with hitherto distant places. Not only does it connect the eastern and western shores of our island at the two great outports of Liverpool and Hull, but it forms a junction with the great eastern line of railway from London northward to Scotland, and by its points of contact with the North Midland, with its extension southwards towards Birmingham, Derby, and the Midland counties; and northward, by the York and North Midland line, to York, Newcastle, and Edinburgh; with the Leeds and Selby line, and its extension to Hull,—it leaves unreached scarcely any important district of the island, hitherto inaccessible by steam-locomotive travelling. When the lines to Leeds, to Birmingham, and the north-western line by Preston and Lancaster to Carlisle, &c., shall be completed, Manchester will then become the great centre of railway communication to all parts of Great Britain.—Abridged from the *Manchester Guardian.*

Manchester and Sheffield Railway.—At the last general meeting, Mr. Vignoles, the engineer, stated, that he considered the Dinting Vale viaduct would be accomplished for 10,000*l.* less than had been estimated. He adverted to the viaduct erected over the river Weir, which had been built of stone, but which, if constructed with timber arches, would probably have reduced the expense to 30,000*l.* The durability of timber would extend to about twenty five years: and if this plan was adopted in the construction of the viaduct at Dinting Vale, as well as in other parts of this line of railway, it would effect a saving of from 50,000*l.* to 100,000*l.* On the Carlisle Railway, to which he begged to direct their attention, there was one cutting, 100 feet deep, which had been most beautifully and efficiently executed at 7d. per cubic yard; the lowest price estimated for on the Sheffield and Manchester Railway was 8d. per yard. Glancing over the whole of the present line of railway, he would not omit to remark, on its advantages arising from the resources of the country, which abounded with the best materials calculated to facilitate the progress of the undertaking. In answer to a question put by a subscriber, Mr. Vignoles observed, that he did not think that any part of this line of railway need occupy a longer period than three years to insure its entire completion. Perhaps, continued Mr. Vignoles, it would not be amiss to state, that the viaduct over the river Weir, on the Grand Junction Railway, cost about 55*l.* per foot, including the deep foundations they had to make. This viaduct was about 300 yards long, and was twenty feet higher than the highest on this line of railway. It consisted of a number of high arches, one of a 160 feet span, another of 140 feet span, others of 100 feet, &c., and the foundations of the water arch were many feet below the river. The cost of the large viaducts with timber arches on the Newcastle and North Shields Railway, averaged from 20*l.* to 25*l.* per foot. In executing this line of Railway, he begged again to impress on their attention the advantages they possessed over most other railways, in the facility of getting materials, in the access and proximity of rocky foundations; no deep rivers to traverse, nor to tunnel through the sides of hills abounding with springs of water and loose strata.

Midland Counties Railway.—Rapid progress is making, between Sawley and Nottingham. In the neighbourhood of Beeston a large quantity of blocks are already laid.

Northampton Railway.—Arrangements are being attempted with the Birmingham Railway Company, by which a branch railway from Blisworth to this town is to be effected. In that case we are informed that the station for Northampton would be at Northampton and not at Blisworth. There would then be no station at Blisworth. It is said that the calculation of cost for such a branch railway would be 80,000*l.*—*Northampton Herald.*

North Union Railway.—A single line of road is completed all through the Ribble contract, extending as far as Farington, with the exception of a short distance at the north and south sides of the Ribble viaduct. With the assistance of a second engine which has arrived from Wigan, the second line of road will be shortly "ballasted."

South-Eastern and Dover Railway.—The extensive works of this national undertaking, at the Shakspeare Cliff and Gallery, are progressing in a manner that must be highly gratifying to their numerous well-wishers in Dover, and the shareholders generally. A few months more, and this classic height will be completely honeycombed by the tunnels; the galleries and shafts are already formed, and the drift ways connecting the shafts have been commenced. Beyond the Shakspeare, the benches on the face of the cliff are finished; and it now only remains to cut out the angular mass between them, when the line will be complete for three miles of the most difficult, though, we think, the least expensive part of this undertaking

Great Western Railway.—The receipts on the line from the London terminus to Maidenhead (only about 26 miles) have in the 88 days, from June to the end of August, amounted to nearly 21,000*l.*—*Reading Mercury.*

The North Union Railway will most probably be opened for the conveyance of passengers on the 1st of October; by which means an uninterrupted railway communication will be opened between Preston and the metropolis, and the distance of 240 miles will be traversed in the short space of 11 hours.

London and Southampton Railway.—The works of the London and Southampton Railway, in the neighbourhood of this city (Winchester), are now bringing to a close. The bridge over the Romsey road is now open to the public, and for some distance a number of labourers are employed preparatory to the permanent rails being laid. We have not heard the precise time of its being open between this city and Southampton, but we should think that by Christmas every thing would be in readiness to run between those places.—*Wiltshire Independent.*

The Bristol and Exeter Railway.—Already has the whole of the works been contracted for from Bristol to Bridgewater, at a cost averaging not more than 7,600*l.* per mile; and, indeed, the works have proceeded beyond Bridgewater. Contracts have been settled for carrying a bridge over the Parrott.

Cheltenham and Great Western Union Railway.—The contracts are let between Cheltenham and Gloucester, very satisfactorily to the directors, and the whole distance between Cirencester and Swindon will be under contract in the course of the present and next month.

South Eastern Railway.—There is now every appearance of the South Eastern Railway being speedily commenced in the Tonbridge district. A contract has been taken, and active operations will be commenced immediately on the eastern side of this town. Several purchases of land have already been made, and a jury will be empannelled on the 2nd of October, to award compensation for land not yet agreed for. As much as 1,200l. has been asked for a little more than an acre and a quarter close by.—*Maidstone Gazette.*

ENGINEERING WORKS.

Proposed Harbour at Hastings.—A numerous and highly respectable meeting was held last month at Hastings to consider the best means for the obtainment of what has long been deemed a great desideratum,—namely, the construction of a safe and commodious harbour of refuge. The mayor presided at the meeting, and Mr. Planta, Dr. M'Cabe, Mr. Richards, Mr. Elphinstone, Colonel Williams, and other gentlemen addressed the meeting on the subject, making an exposition of their several views, both as to the plans desirable to be adopted, and the advantages likely to result from the undertaking. The plan which had been proposed by Mr. Cubitt was resolved to be impracticable, but a resolution for appointing a committee "to take steps to ascertain the possibility of making a harbour, pier, or wharf at Hastings, for the accommodation of steamers, fishing-boats, coasters, and pleasure boats, at an expense not exceeding 60,000*l.*," was adopted, and a committee appointed accordingly.

Improvement of Berwick Harbour.—The projected improvements in Berwick harbour are now likely to be carried into effect with great spirit. Through the exertions of our excellent representatives in Parliament, a loan of 10,000*l.* has been obtained for the purpose from the Exchequer Loan-office. This arrangement will enable the harbour commissioners to proceed with their work without delay. They propose to deepen the river ten feet, all the way from the bridge to the bar; to clear all away to the same depth from the quays to the centre of the stream, so that vessels can lie afloat at low water; and if their means will allow of it, to deepen the bar also, so that vessels of heavy burden can enter the harbour at all times. Great improvements are also to be made on the quays. It is probable that one continuous quay will be made from the bridge to the present extremity of the low ballast quay, removing the patent slip to some other situation; and from the depth of water there will at all times be, the largest steamers, and other vessels, will be enabled to lie conveniently alongside this quay, at any part, and at all periods of the tide. The works will be commenced immediately. The dredging machine for the purpose of deepening the river is nearly ready, and the several lighters required to assist in the process are also in hand. The improvements cannot fail to contribute most materially to the prosperity of the port, and for this the town will stand much indebted both to their representatives, who have so ably assisted in procuring the means for carrying them into effect.—*Berwick Warder.*

Two skilful engineers, by order of the government, are at present making a survey and taking a plan of the river Tees, for the purpose of erecting a battery for the protection of the shipping entering that port, in case of war between this country and any foreign power.—*Leeds Intelligencer.*

NEW CHURCHES.

Ashby-de-la-Zouch New Church.—The ceremony of laying the first stone of the new church at Ashby-de-la-Zouch (which was performed by the Earl Howe), took place on Saturday, 25th August last. The church, which is now in the course of erection, under the direction of Henry J. Stevens, Esq., the architect, is to be of stone, and consists of a nave, 70 feet by 46 feet 6 inches, a recess at the east end 22 feet by 9 feet for the Communion, flanked by a vestry and porch. The principal entrance is under the tower, which is 11 feet square within, and 65 feet high, with double rectangular buttresses terminated by four lofty octangular pinnacles. The side entrances and staircases to the galleries are on the right and left of the tower, and correspond externally with the nave. The style of the church is early English, which is strictly preserved throughout; and it is capable of containing upwards of 900 persons. The contract for the erection does not exceed £2,700, and it is expected to be completed by the latter end of next year. We hear that the liberality of a few individuals has suggested the addition of a spire, for which the design is well adapted, and we sincerely hope that such a truly English termination may not be abandoned for want of sufficient funds.

Christ Church, Old Kent Road.—Thursday morning, September 13, the ceremony of the consecration of this church, lately erected in the Old Kent-road, took place. The church, which is a neat and convenient structure, is situated in the parish of St. Giles, Camberwell. We understand the ground was given by Mr. R. Turner, and the expense of the building, which was about £5,000, defrayed from a sum of money left by a gentleman for the building and endowment of the church. The church contains sitting-room for 1,200 persons, many of which are free and unappropriated.—*Times.*

A new church is being erected in the New North Road, Hoxton, under the direction of Mr. Blore, the architect; Messrs. Webb are the contractors. Amount of tender about 4,000*l.*

Donisthorpe Church.—The church which has lately been erected at Donisthorpe, was consecrated on the 25th August last, by the Lord Bishop of Lincoln. The church is built upon an acre of land, given for the purpose by Chas. Greaves, Esq., and is of the early English style of architecture. It consists of a nave 65 feet long by 35 feet 6 inches wide, a chancel at the east end 19 feet by 6 feet, and a tower, under which is the entrance, 9 feet square within, and 58 feet high, surmounted by four pinnacles. It is externally cased with stone, and the interior is fitted up with wainscot oak, and is capable of containing upwards of 400 persons, without galleries, and we believe the cost does not exceed £1,500. Half the accommodation is free and unappropriated.—*Derby Mercury.*

FOREIGN INTELLIGENCE.

Versailles.—The palace and gardens of Versailles have, since the time of Louis XIII., cost 1,200 millions of francs, or nearly 50 millions sterling; and considering that the value of money a hundred years ago was twice or thrice greater than now, the actual expense in the value of our time is much more.

Berlin.—On the 18th of May the first stone was laid at Berlin of an hospital for old and decayed householders, called, in honour of his Russian Majesty, the Nicholas Burgher Hospital.

Russia.—Among the colossal works now erecting at Odessa, the great emporium on the Black Sea, is a gigantic staircase of white marble of 200 steps, in ten divisions with landing places, which, as they gradually diminish from 350 feet wide at the bottom to 175 feet at the top, present the appearance of a complete pyramid. It is decorated with thirty Corinthian columns, and is on the face of a hill, 100 feet above the level of the sea, uniting the upper town to the harbour and lower town.

First Bridge over the Nile.—The works on this undertaking have at last commenced, and 24,000 men are now employed upon the bed of the river, the construction of dams, &c., besides 340 carts and 500 carpenters from Alexandria. In order to avoid any deficiency of labourers, four regiments of infantry are employed, who have a camp in the neighbourhood. This gigantic bridge is on the south corner of the Delta, 25 miles from Cairo, just at the point where the Nile divides into two branches. It is intended also to cut a sluice to keep up the waters in winter and spring, and canals are to be cut from the river to irrigate the land. A railway eleven miles in length has been commenced, to communicate between the stone quarries of Mokatum and the bridge.

Dock at Cherbourg.—Two thousand four hundred men are now employed in excavating the new dock at Cherbourg, which is on the same scale of grandeur as the other works at that port.

We understand that an English gentleman of science has been associated by his excellency the lieut.-governor with the civil engineer, who had been recommended to his excellency to carry into effect the resolution and vote of the House of Assembly for an exploration, with a view to the removal of the obstructions to the navigation of the river St. John, from Fredericton upwards. This is a very desirable object, and we have little doubt that steam-boats will be enabled to ply as high as the neighbourhood of the Grand Falls, the waters of the river above which might easily be connected in a navigable manner with those below by means of a canal. We have been as high as th eTobique, and the St John to that point keeps its width in a most remarkable manner; while the obstructions to navigation above Woodstock are slight, and it is probable could be easily removed. The undertaking, therefore, is one of great importance, and will doubtless lead to beneficial results.—*Fredericton Sentinel.*

Holland.—The Estates of Holland have declared themselves favourable to the project for draining the lake of Haarlem, and considering the importance of such an undertaking, have granted the sum of 60,000 per annum for ten years, each of the two parts of the province (North and South Holland) to contribute equally.

The church of the Bernhardines, at Posen, in Prussian Poland, was destroyed by fire on the 30th August. The following account of this event is given by a German paper:—"The alarm was given at 7 o'clock. Since the dissolution of the monasteries the church had not been used for divine service, but served latterly as a hay magazine. The cause of the fire is not yet known. Malice is hardly to be imagined, and yet the spontaneous combustion of the hay cannot be assumed, as it was last year's crop. However, the fire was not discovered till the whole church was in flames. An hour had scarcely elapsed when the flames reached the steeple, which soon appeared like a pyramid of fire rising in the dark sky, and thus affording a splendid sight. The whole population hastened to the spot, partly to afford assistance, if possible, partly to observe from the great Bernhardine-square the awfully sublime scene. At length the steeple fell with a tremendous crash, but did no mischief. The church itself burned all the night long, and this morning only some bare walls remain. Happily for the town, the wind, which was rather high, blew in such a direction as to hinder the spreading of the fire. Had it blown in another direction, either one of the finest streets or the convent itself, with the great church and its two magnificent towers, would have fallen a prey to the fury of the flames. Happily no lives were lost."—*Hamburgh paper.*

Belgium.—The opening of the section of the railway from Bruges to Ostend, took place on Tuesday, 28th August, with great ceremony, in presence of their Majesties, and a great number of persons of distinction. On account of the want of locomotives, one journey a day only is made. Between Bruges and Ghent no short trips are allowed, and no passengers for pleasure, only for business. Preparations are already being made to profit by the anticipated increase of traffic; two steam boats, instead of one, are now placed on the station between London and Ostend, by the General Steam Navigation Company, and through the enterprize of some of the English established at Bruges, another steam boat will, by the beginning of October, be placed there, and another is about to be built at Bruges. The English government has long talked about establishing daily mail communication, but it is not yet done.

Belgium.—The Antwerp papers mention that the Belgian Government had just published a royal decree, by which it is determined that the Hainault railway shall pass by the way of Soignies, and that from Namur to Brussels through the valleys of the Orneau. The projected route by Tirlemont has accordingly been abandoned.

Belgian Railways.—There are now six lines open in Belgium; from Mechlin to Brussels, Antwerp, Louvain and Dendermond; from Dendermond to Ghent; Ghent to Bruges, Bruges to Ostend; Louvain to Tirlemont; Tirlemont to Waremmes, and Waremmes to Ans. The total length is 256,000 metres, or 160 miles. The communication from London to Brussels is now in 20 hours.

Alexandria.—The two-mile railway mentioned in my letter of last month, that was to be laid outside the Roetta gates of Alexandria, for the purpose of exhibiting one of the locomotive engines sent out for the railroad across the Suez desert, has been completed, and the engine tried on it. It went full forty miles an hour, and the Pacha and people were highly satisfied and delighted therewith. This portion of railroad has been taken up again, as it was merely laid for the experimental purpose of trying the locomotive engine, and gave, as well as the engine, perfect satisfaction. —*Shipping Gazette.*

Switzerland.—The beautiful village of Heiden, near Appenzell, running a length of nearly half a league, and containing upwards of 100 houses, together with the church, was totally destroyed on the 7th ultimo by fire, originating in an iron foundry established there.

Rome.—The Pope has given orders for the preservation of the mausoleum lately discovered before the Porta Maggiore.

The colossal bronze statue of Marshal Mortier, erected at Cateau, near Cambrai Nord, was inaugurated with great ceremony on the 16th ult. The Prefect of the Department delivered an impressive oration, which was received with repeated cheers of approbation and shouts of *Vive le Roi!* On the face of the pedestal is inscribed—"Au Maréchal Mortier, né au Cateau en 1768, mort assassiné à côté du Roi, le 28 Juillet, 1835." On the opposite side "Mutten-Thal, Hanovre, Dierustein, Ocana, Moscou, Lutzen, furent les principeaux théâtres de sa gloire."

Potsdam Railway.—The first half from Potsdam to Berlin is to be opened in September by the Emperor of Russia. The directors hope to have the remaining section open in the autumn, when the passage can be effected in half an hour; but this part has a pretty long cutting 35 feet deep, with a bridge and afterwards a tunnel, carrying the high road over the railway.

St. Germain Railway.—The number of passengers in the first year, from 26th August, 1837, to 26th August, 1838, has been 1,375,396, and the receipts 1,550,144f. 35c., or 60,000*l.*

The St. Cloud Railway was opened to the public on the 7th ult. A second trial was made of the locomotive engine, the Stephenson, which started with a train of ten waggons soon after 10 o'clock, and arrived in 22 minutes; but on its return only took 19 minutes. The St. Cloud coaches, by the ordinary road, took an hour.

Constantinople.—New buildings are proceeding with great activity; among others are a naval school, lazaretto, steam saw-mill, &c. A theatre for Europeans is in contemplation, the funds to be raised by a company with 500 shares of 1,000 piastres each.

The Versailles and St. Cloud Railway.—The works beyond the latter place are going on with great rapidity. The grand tunnel is nearly cleared, and will require but little being done to it during the winter. The viaduct at Ville d'Avrey having slightly given way in two places, it has to be supported by two buttresses, which will cost as much as the arch itself. The directors have yielded to the remonstrances of the town of Versailles and the authorities of the department, and have determined to form a tunnel under the Avenue de Picardie, instead of the open cut at first intended; this work is begun, as well as that in the park of Clagny. It is expected that this remaining portion of the road will be opened in April, unless the works are impeded by unfavourable weather.

The Leipsic Railway.—Leipsic, Sept. 10.—On the 16th instant the road opens from Leipsic to Dahlen, and from Dresden to Oberau, so that there will be 42 miles in operation. The King went yesterday along the line, and came the whole distance from Dresden to Leipsic (75 miles) in five hours and a half. Up to the 31st of August, 360,508 persons have travelled along the railway in 2,964 journeys, or 122 per voyage.

Amsterdam, Sept. 19.—We learn that his Majesty will lay before the States-General, in the next session, a proposal of law relative to the iron railway to the Rhine, in order to prevent the delays that have taken place with respect to the Haarlem railway. This law seems to have only a special object, and not to interfere with the rights accruing to the government from the imperial line of 1810.

LIST OF PATENTS GRANTED BETWEEN THE 31st OF AUGUST AND THE 27th OF SEPTEMBER, 1838, BOTH INCLUSIVE.

John Keys, of Sutton, in the Parish of Prescot, in the County of Lancaster, Copper Smelter, and William Thompson Clough, of Eccleston, in the parish of Prescot, for "A Method or Process for the Manufacture of Sulphuric Acid from Copper Ore, Copper Regulus, and Sulphuret of Zinc."—31st August; 6 months.

Morton Balmanno, of Queen Street, Cheapside, in the City of London, Merchant, for "A New and improved Method of Making and Manufacturing Paper, Pasteboard, Felt, and Tissues."—6th September; 6 months.

Timothy Burstall, of Leith, in that part of the United Kingdom called Scotland, Engineer, for "Certain Improvements in Steam-Engines, and in Apparatus to be used therewith, or with any other Construction of the Steam-Engine, or other Motive Power, for the more smooth and easy Conveyance of Goods and Passengers on Land and Water, part of which will be applicable to Water Power."—6th September; 6 months.

Henry Gibbs, of Birmingham, in the county of Warwick, Button-manufacturer, for "An Improved Perforated Button."—6th September; 6 months.

John Frederick Bourne, of Manchester, in the County of Lancaster, Engineer, and John Bartley, Jun., of the same place, Engineer, for "Certain Improvements in the Construction of Wheels to be used upon Railways and other Roads, and which Improvements are also applicable to the Construction of Wheels in general."—6th September; 6 months.

Miles Berry, of 66, Chancery Lane, in the County of Middlesex, Patent Agent, for "Certain Improvements applicable to Certain Parts of the Process generally used for the Manufacturing and Refining of Sugar; communicated by a Foreigner residing Abroad."—6th September; 6 months.

Joseph Brown, of the Minories, in the Liberty of the Tower of London, Upholsterer, for "Improvements in Beds, Sofas, Chairs, and other Articles of Furniture, to render them more suitable for travelling and other Purposes."—8th September; 6 months.

James Ulric Vaucher, of Geneva, in Switzerland, but now residing at Manchester, Gentleman, for "Certain Improvements in Fire Engines, Watering Engines, and other Hydraulic Machines, and Apparatus for Raising or Propelling Water and other Fluids, some of which Improvements are also applicable to Steam Engines."—8th September; 6 months.

Henry Dunnington, of Nottingham, Lace Manufacturer, for "Improvements in Machinery employed in making Frame Work, Knitting, or Stocking Fabrics."—10th September; 6 months.

Alexander Southwood Stocker, and Clement Heely, Manufacturers, of Birmingham, in the County of Warwick, for "Improvements in Straps for Wearing Apparel."—10th September; 6 months.

Ambroise Ador, of Leicester-square, in the County of Middlesex, for "Certain Improvements on Lamps, or Apparatus for Producing or Affording Light."—13th September; 6 months.

Thomas Swinburne, Esq., of South Square, Gray's Inn, for "Certain Improvements in Water-Closets, and other Conveniences of the kind."—13th September; 6 months.

Archibald M'Lellan, of the City of Glasgow, Coach Builder, for "Certain Improvements upon the Springs and Braces of Wheel-Carriages, and upon the mode of hanging such Carriages."—13th September; 6 months.

Frederick Le Mesurier, of New Street, Saint Peters Port, in the Island of Guernsey, Gentleman, for "A certain Improvement or certain Improvements in the Construction of Pumps, for raising Water or other Fluids."—13th September; 6 months.

Sir Hugh Pigot, of Foley Place, Marylebone, and County of Middlesex, Knight, "For a certain Engine or Engines, useful as Steam-Engines, Pumps, or Propellers of Vessels or Machinery."—13th September; 6 months

William Day, of Gate Street, in the Parish of Saint Giles-in-the-Fields, in the County of Middlesex, Lithographer, for "An improved Mode or Method of applying and combining Timber and other Materials used in the Construction of Ships or Vessels, Masts, Yards, Beams, Piers, Bridges, and various other Purposes."—20th September; 6 months.

James Nasmyth, of Patricroft, near Manchester, in the County of Lancaster, Engineer, for "Certain Improvements in Machinery, Tools, or Apparatus, for Cutting or Plaining Metals and other Substances, and in securing or fastening the Keys or Cottars used in such Machinery and other Machinery where Keys or Cottars are commonly applied."—20th September; 6 months.

Joseph Hall, of Over, in the County of Chester, Plumber, for "Improvements in the Manufacture of Salt."—13th September; 6 months.

John Chanter, of Earl Street, Blackfriars, in the County of Surrey, Esquire, and John Grantham, of Liverpool, Engineer, for "Improvements in Furnaces for Steam Boilers."—13th September; 6 months.

Edwin Bottomly, of South Crossland, in the Parish of Almondbury, in the County of York, Clothier, for "Certain Improvement or Improvements applicable to Power and Hand Looms."—13th September; 6 months.

Edward Massey, of King Street, Clerkenwell, in the County of Middlesex, Watchmaker, for "Improvements in Watches and Machines for keeping Time."—13th September; 6 months.

James Wapshare, of Bath, in the County of Somerset, Gentleman, for "Certain Improvements in the Application of Heat, for the Purpose of drying Wool, Woollen Yarns, Woollen Cloths, and other Articles, and other Improvements connected with the Use of the Press, in the Process of Dressing or Finishing Woollen Cloths."—13th September; 6 months.

Joseph Wilkinson, of the Quadrant, Regent Street, in the Parish of St. James, in the City of Westminster, Ironmonger and Engineer, for "Certain Improvements in the Construction of Tram or Railways, and in the Carriages to be used thereon."—18th September; 6 months.

Robert William Sievier, of Henrietta Street, Cavendish Square, in the county of Middlesex, Gentleman, for "Certain Improvements in Rigger Pulley Bands, for driving Machinery, and Ropes and Lines for other Purposes."—20th September; 6 months.

John Thomas Betts, of Smithfield Bars, in the City of London, Rectifier, for "Improvements in the Manufacture of Gin, which he intends to denominate Betts' Patent Gin, or Betts' Patent Stomachic Gin. Communicated by a Foreigner residing Abroad."—21st September; 6 months.

James Walton, of Sowerby Bridge, in the Parish of Halifax, in the County of York, Clothdresser and Frizer, for "Certain Improvements in Machinery for Making Wire Cards for Carding Cotton, Wool, Silk, Tow, and other Fibrous Substances of the like Nature."—21st September; 6 months.

John White, of Haddington, North Britain, Ironmonger, for "Certain Improvements in the Construction of Ovens and heated Air Stoves."—27th September; 6 months.

Edmond Henze, of Fenton's Hotel, St. James's Street, Merchant, for "Improvements in the Manufacture of Dextrine."—27th September; 6 months.

John Joseph Charles Sheridan, of Ironmonger Lane, Chemist, for "An Improvement in the Manufacture of Soap."—27th September; 6 months.

John Hughes Rees, Esq., of Penymaes, in the county of Carmarthen, for "Certain Improvements in the Machinery applicable to the raising of Water for propelling Boats, Carriages, and other Machinery."—27th September; 6 months.

Emile Alexis Fanquet Delarue, Jun., of Bacon's Hotel, St. Paul's Churchyard, for "Certain Improvements in Printing, and fixing Red and other Colours in which Red forms a constituent Part upon Cotton, Silk, Woollen, and other Fabrics."—27th September: 6 months.

MISCELLANEA.

Asphalte Experiments.—By the proceedings of the Prussian Association for Promoting the Arts, we see that they have laid down a pavement of nine different compositions, of asphalte, coal tar, oil, sand, lime, chalk, &c. Observations will be made to ascertain the durability and relative properties of the several compositions.

The remains of a Roman villa have recently been found on the estate of Mr. John Henry Shore, at Whatley, near Frome, Somersetshire. Earth to the depth of three feet has been removed, and a fine tessellated pavement uncovered, consisting, as it at present appears, of two rooms connected together; one of them being about 32 feet by 20, and the other 22 feet by 14. The pavement is tolerably perfect, but has suffered damage in one part. The tesseræ is very small and of seven different colours. Some coins, and which are believed to be of the reign of Constantine, Roman pottery, and other curious antiquities, were dug up at the time the excavation was made. It is believed, from the appearance of the surrounding earth, that if the excavations were continued further interesting discoveries would be made.

Fire at the London and Birmingham Railway Station.—On Sunday evening, 22nd ult., an alarm was given at the station at Euston-square, and along the line of road for a considerable distance, that the large warehouses erected at Camden-town for depositing heavy luggage, &c., were on fire. Men were dispatched in all directions to the spot, and found the whole of the straw, with which the flooring of the place was covered, in one mass of blaze, which had reached a tarpauling, covering 20 or 30 tons of luggage, which was also on fire. The luggage consisted partly of articles of a combustible nature, among which, in consequence of the shooting season, there was a great quantity of gunpowder, for which the greatest fears were entertained, but owing to the intrepidity of one of the engineers, it was speedily arrested; he having mounted the pile of luggage, and, at the risk of his life, succeeded in removing the burning tarpauling. A plentiful supply of water was immediately procured, and by the exertions of the men, we are happy to say the injury sustained was very slight; but had it not been discovered in the manner it was, doubtless property to a very considerable amount would have become a sacrifice. The fire originated through the carelessness of one of the porters in leaving a lantern among the straw, whilst he went about something, with the wick so high that it melted the solder of the lantern, and causing it to fall to pieces, exposed the bare light among the straw. The directors have ordered the man's discharge forthwith.

Railway Switch Signal.—We have recently had an opportunity of inspecting a railway signal erected at the Grand Junction station, Birmingham, which, from its great simplicity, and the unerring certainty with which it conveys the requisite information, as to the state of the points, to the drivers of locomotive engines, both by night and day, appears to be an invention highly important, not only to the proprietors of railroads but to the public generally, as it will greatly tend to prevent those accidents which have occasionally occurred in consequence of the points (or switches as they are called) being left in a wrong position. The invention consists of two discs, about two feet in diameter, placed at right angles, surmounted by a lantern showing four lights, but of three distinct colours—viz., two red, one blue, and one white; the discs are painted to correspond. This apparatus is firmly attached to the top of the eccentric shaft employed in moving the points, and consequently turns with it with unerring certainty, and can be seen at a great distance, affording the enginemen or drivers ample time to govern the trains according to circumstances. The signal is the invention of Dr. Church, of Birmingham, and has been patented; and there is no doubt it will soon be adopted by the railway companies generally.—*Midland Counties Herald.*

Captain Norton's Percussion Lead, for exploding Charges of Powder at the Bottom of Harbours and Rivers.—A sea lead is charged at its heavy end with a small iron tube, having a percussion cap at each end, filled with gunpowder; the lead has two eyes or rings on its sides in a straight line, through which a cord is run, one end being attached to the box of powder, at the bottom of the water; the lead is allowed to slide along the cord, and on striking the box, explodes it; a thin piece of sheet lead or copper being fixed to the box, when the percussion primer strikes. Captain Norton successfully tried his percussion lead at the Polytechnic Institution, Regent Street, on the 19th ultimo; he proposes this means as a substitute for the fuzes at present in use, being more simple, less costly, and easy of application.

Meteorology.—The Annals of the Board of Longitude, for 1834, contains an article by M. Arago, on the "Mean temperature of the Globe, and on the heat of summer in the 19th century, in different regions, as compared with periods more remote." This learned astronomer proves, that the general temperature of the earth has not varied the tenth-part of a degree in 2000 years; and that the climate has become neither warmer nor colder in any place in which the physical aspect has not sensibly changed during a long period of ages; thus the palm-tree and vine flourish still at the gates of Jericho and upon the banks of the Jordan, and that no difference in the time of the fruit arriving at maturity has been observed for 33 ages; but during this period, the hand of man has neither cut down the forests nor drained the soil of Palestine. Do the same things exist as regards France?—The most incontestible proofs attest the contrary. A few ages past, good wine was made both in England and in the north of France; now, on account of the coldness of the summers, such a thing would be impossible. The old chronicles inform us, that in England the vine was formerly cultivated in the open air, and that wine was made there. The Emperor Julian, during his stay at Paris, drank the wine of Surêne; the City of Valenciennes was surrounded with vineyards. In 1456, the land between the gardens of the palace of Comté and the walls of this city was called the "Vineyard of La Salles." But a most conclusive fact is furnished by Outranan, in his history of Valenciennes, who, expressing himself in his quaint style, says, "This year (1575) was so abundant in vine, that there are sold in Valenciennes every Saturday, at least 1800 pieces." We read, likewise, in the "Recollections of Douai," by M. Plouvian, that in the 13th and 14th centuries, there was made in that city about 20,000 pots of wine per annum, each equal to two litres, eight catititus; the largest garden for vines being situated upon the ground now occupied by the Arsenal, and in the vicinity of the "Trinitanics." Meteorologists attribute this sensible diminution of summer heat to the thinning of the forests, and to the almost complete disappearance of the peat bogs and stagnant waters, and to the rivers being confined to their proper channels by embankments, which formerly overflowed the country. North America, at the same time, presents us with a like phenomena. During the few years since the various works for draining the country have been carried into effect, it has been remarked that the summers have become colder in that part of the New World. *(Echo de la Frontera.)* It occursto us, from our own observations, that the French editor is wrong in his statements, both in the United States and in Mexico. In proportion as the land is altered, the temperature is known to increase. Robertson, in his "History of America," accounts for the greater degree of cold in the same parallels of latitude in the New World to those in the Old World, by the dense forests intercepting the sun's rays, and thus the earth is kept cool, and also to the exhalations from the marshes, as it is a well known chemical fact, that evaporation produces cold; so that we apprehend that M. Arago is right, when he says, that where no sensible alteration has taken place in the physical features of a country, no alteration will be, as has been observed, in the temperature.—*Editor C. E. and A. Journal.*

Iron Welding.—A practice has for some time prevailed at Keswick, of welding iron and steel with a mineral which is said to be very abundant in that neighbourhood, and is found to answer the purpose much better than sand or borax, inasmuch as it affords a decidedly better protection to the fusing metals. It is used in the same common or simple way as sand, requiring no further care or management. Two, three, or more pieces of cast steel may be welded together, and drawn out, hardened, and broken across the junctures, which cannot be observed; or iron and cast steel can be welded together in the same way, as perfectly and with as much ease as the hardest steel or iron.—*Carlisle Patriot.*

Railway Charges.—Considerable dissatisfaction has been expressed, and very justly, we think, during the past week, by the manufacturers and tradesmen generally in the town, at the sudden increase in the charge of carriage by the directors of the Birmingham and London Railway Company, from 1d. to 1½d. per lb. It is, we think, somewhat early for this company, who has in a measure possessed itself of the only means of transit between the metropolis and the heart of the kingdom, to put the screw on the confiding public. What we would recommend would be, that a public meeting of the inhabitants be immediately called, with the view to coming at once to an understanding with the directors upon the point whether or not the whole country is to be subject to the caprice or cupidity of the railway monopolists.—*Birmingham Advertiser.*

The Thames Water.—Sir Anthony Carlisle, in the branch of his work just published on health and old age, devoted to the medical topography of Lodnon, says, that "the ebb and flow of the tides in the river, and the regurgitation of fresh water, deposit on the exposed banks a large portion of the filth produced in the metropolis, and subject to evaporation along the wide spaces of the borders of the river. As the sea water does not ascend through the town, a large portion of the Thames water charged with filth must pass and repass the town at every tide, and deposit its sediment. The shores of the river, as it ebbs through the town, are largely exposed at low water, and exhibit banks of putrescent mud, which, in the summer season, abounds with the larva of gnats, which live upon, and help to consume the filth; in fact they are invaluable scavengers."

Ancient Edifice.—M. Prosper Merimée, who has recently been on an inspecting tour, states, that the church of Conques is a perfect model of Byzantine architecture, and displays the whole state of architectural knowledge at the beginning of the eleventh century. It is one of the most beautiful edifices of its kind in France, and the town itself possesses a number of relics which are valuable either for their materials, their workmanship, or their antiquity,—for some belong to the time of Charlemagne. Almost all are enriched with engraved stones, and one is ornamented with paintings in enamel. The date of this is 1106, and settles a long-disputed point on the exact period of the Middle Ages when this method of painting was employed.

Mineral Produce of Great Britain.—We give the following estimate of the mineral produce of Great Britain, on an average of years and prices, from the *Mining Review*:—

	Quantity.	Value.
Silver	10,000 lbs. Troy	£80,000
Copper	13,000 tons	1,300,000
Tin	5,500 tons	550,000
Lead	46,000 tons	950,000
Iron	900,000 tons	7,000,000
Coal	25,000,000 tons	10,000,000
Salt, Alum, and other minor produce, more than		1,000,000
Total value probably exceeds		£20,000,00

Geological Discovery.—An interesting geological specimen has just been discovered, at the depth of thirty-seven feet below the surface of the rock, in the new red sandstone at Storton-hill quarries, four miles from Birkenhead, in Cheshire. It is a series of impressions of footsteps, in relief, of an extinct animal, called by Professor Kaup the Cheosotherium, the existence of which in former ages, has been known only from similar marks having been found. The impressions bear a strong resemblance to the human hand. Mr. Tomkinson, the lessee of the quarry, on being made acquainted with the value of the slabs on which these marks appear, has, in the most liberal manner, not only given one up, without charge, to the Natura History Society of this town, but will convey it to its destination at his own expense. He purposes, also, to send another to the London Geological Society. Professor Buckland has given an account, illustrated by engravings, in his "Bridgewater Treatise," of the impressions of footsteps of the same extinct animal discovered in the quarries of Hessberg, in Saxony. The slab of sandstone is in the British Museum.—*Liverpool Albion.*

Projectile Experiments.—A large concourse of people assembled at the Pier-head on Thursday June 21st, to witness a variety of experiments made on a new projection to afford assistance to distressed vessels at sea. The improvement, we understand, cosists in the use of rockets to propel a rope to any object at sea, instead of a mortar, as hitherto used with Captain Manby's apparatus. The advantage, as shown by the experiment on Thursday, is evident; as in the first place the ascension of the rocket is more even than that of a shell projected from a mortar; and in the second, a great increase of power is gained. The result of the experiments was perfectly satisfactory, a rope being several times thrown to a boat moored about 260 feet at sea, as well as 200 feet beyond, without the failure hitherto so frequently experienced with the mortar, which detached itself from the rope by the violence of its exit. The manner also of directing the rocket, which is done by a case mounted on a swivel, is simple and effectual. Afterwards the qualities of a new life-boat were tested, by upsetting it near the pier, with the anticipation that it would right itself. This, however, did not prove the case in every instance, probably from the utter placidity of the sea, which was undisturbed even by a ruffle.—*Brighton paper.*

Raising of her Majesty's Ship Pincher.—The wreck of the ill-fated schooner Pincher, which sank off Bognor some time since, was raised on June 19th by two government lighters, after some delay, caused by waiting for tide, fine weather, &c. The tackling broke in the first instance, but the second attempt was attended with success. A government steamer, which was in readiness, took the Pincher and the two lighters in tow, and brought them into Portsmouth harbour the same evening. —*Sussex Express.*

NOTICES TO CORRESPONDENTS.

We shall feel obliged to the Profession for accounts of Works in Progress, New Inventions, and Discoveries; it would be doing us a great service if our Country Subscribers will forward us any Newspaper containing information connected with the objects of our Journal.

Subscribers are particularly requested to make up their sets of the Journal, as the First Volume will be completed with the December number, which will contain an index, title page, and introduction. In consequence of this additional matter, the December number will be charged sixpence *extra*.

Books for Review should be sent early in the Month—Communications on or before the 20th—and Advertisements on or before the 25th instant.

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&c. &c. &c.

PROSPECTUS.

1. The Plan now submitted to the Public is for the establishment, within the confines of London, of an Institution, with extensive Botanic Gardens, Library, Museum, Studio, Hot-houses, Conservatories, &c.

2. The Ground selected for the Gardens is admirably adapted for the purpose, both as regards its form and situation, being the space included in the inner circle of the Regent's Park. It contains eighteen acres, which will be appropriated for the reception of the plants indigenous to the several divisions of the globe. The Ground will be disposed in imitation of the Gardens of different countries, and the architectural ornaments will also be in unison with the peculiar features of the respective regions.

3. Conservatories, which are so essential in this country, will be erected upon a scale commensurate with this Undertaking. Extensive Lawns, Terraces, and Promenades, interspersed with Parterres, Fountains, Statues, Vases, and other works of art, will be introduced.

4. There will also be a Lake of sufficient magnitude for the growth of aquatic plants, and likewise Artificial Rocks for the disposition of mountainous productions.

5. The plants will be arranged according to the two great systems of classification—the Artificial and the Natural.

6. An important appendage contemplated, is the formation of a Medico-botanical Garden.

7. A new and valuable feature of the present project, will be a collection of all the plants applicable to the arts and manufactures, of whatever country they may be natives, with a view to extend the cultivation of those which may prove most useful. By this means many products which are now obtained with great labour and expense, may be supplied in our own climate.

8. A well-selected Botanic Library and Museum will be attached to the Institution;* and also a Studio, which will be set apart for those who may be desirous of copying the productions of Nature; and able Professors of Botany and Drawing will be appointed to give Instructions and Lectures during a considerable portion of the year.

9. Public Botanical Exhibitions, which may lead to the improvement of the Science, will be encouraged, and every facility will be given to professional Florists and Nurserymen, to obtain specimens of rare and valuable plants, and to display those of their own growth.

10. Thus, for the study of their respective pursuits, ample opportunities will be afforded to the Botanist, the Medical Student, the Artist, the Gardener, the Manufacturer, and to all those who wish to apply the study of botanical productions to the improvement and embellishment of their respective departments in the Arts and Sciences.

11. The Constitution of this Society is founded upon laws similar to those which regulate other scientific bodies; its Government consisting of a President and Council, with a Society of Fellows and Members, which is intended to be incorporated by Royal Charter.

Possession has been obtained of the Ground, and active operations commenced.

Donations paid into the Bankers' hands before the 1st of January, 1839, will entitle the Donors to the following privileges, and exempt them from Annual Subscriptions:—

A payment of 10 guineas will entitle the Donor to a Free Admission for Life.
20 guineas will entitle the Donor to become a Fellow of this Society for Life, and to the introduction of Two Friends to the Gardens.
30 guineas, ditto, ditto, and to the possession of One Ivory Transferable Ticket, admitting Two Persons.
50 guineas, ditto, ditto, and Two Ivory Transferable Tickets, each admitting Two Persons.
100 guineas, ditto, ditto, and Three Ivory Transferable Tickets, each admitting Two Persons.

The qualification to become a Fellow by *Annual Subscription*, will be the payment of an Entrance Fee of Five Guineas, and an Annual Subscription of Two Guineas, commencing on the first day of January next.

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JAMES DE CARLE SOWERBY, F.L.S.
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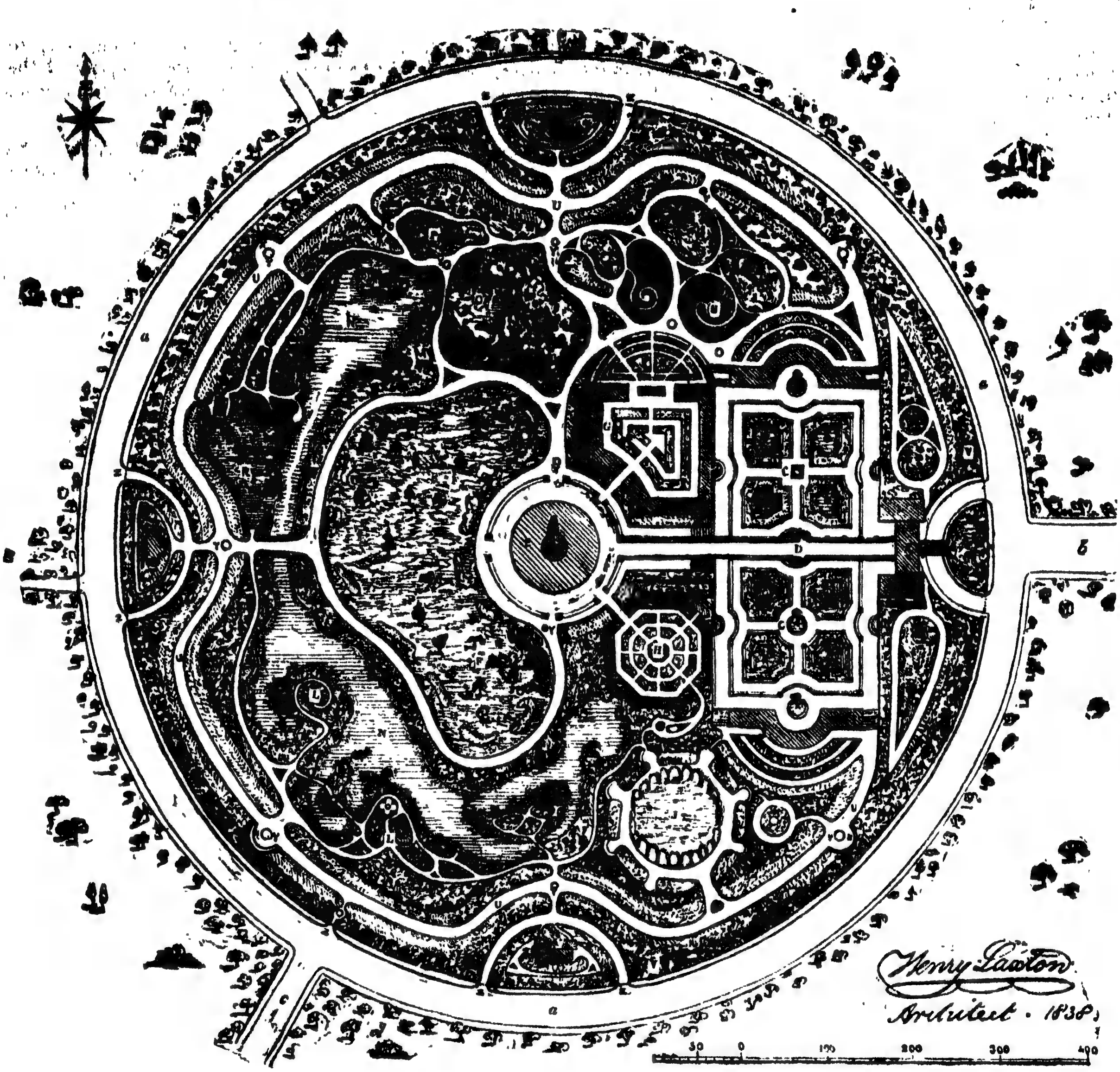
} Secretaries.

Temporary Offices, No. 11, Parliament Street.

* The Provisional Committee avail themselves of this opportunity to return thanks for several valuable Contributions already received.

THE GARDENS OF THE ROYAL BOTANIC SOCIETY,

INNER CIRCLE REGENT'S PARK.



DESCRIPTION OF THE PLAN.

A.—Principal Building, approached by a semi-circular drive, containing the Botanical Museum and Library, Reading, Drawing, and Lecture-rooms, and offices for the general business of the Institution.

B. B.—Gardens attached to the Establishment.

C. C.—Italian Garden with raised terraces, fountains, and *parterres*, ornamented by ballustrading vases, figures, and other works of art; with Conservatory at one end, and Casino at the other.

D.—Grand Promenade formed upon a viaduct, and protected on each side by ballustrading, enriched by vases and figures.

E.—Extensive domed Conservatory for large specimens of the exotics and creeping plants.

F.—English Garden—a lawn embellished with *parterres*, ornamental trees, and shrubs.

G.—Medico-Botanic Garden, with extensive range of Conservatories, Stoves, and Hot-houses.

H.—Dutch Garden formed geometrically, with canal around, and fountain in the centre.

J.—Rosarium—a level lawn, with arched trellis work, and borders for every kind of rose.

K.—Swiss cottage and garden upon an island.

L.—Oriental garden, with Persian and Chinese kiosks, pagodas, bridges, &c.

M.—American garden.

N.—Lake for aquatic plants, and small islands for the willow, and other plants requiring moist localities.

O.—Artificial rock work, for the growth of rock plants, with reservoir at the top and cascade.

P.—Hermitage.

Q.—Arboretum and shrubbery.

R.—Lawn, with drooping ash trees.

S.—Mound, with prospect tower.

T.—Memento mori—Lawn surrounded by foliage, for busts of celebrated botanists and scientific men.

U.—Grand walk, with wide borders on each side, for the scientific arrangement of the plants.

V.—Belt of trees and shrubs surrounding the gardens.

W. W. W.—Ornamental residences for the officers of the establishment.

X. X. X.—Covered seats.

Y.—Statues, vases, sun dials, and other works of art.

Z.—Exit town gate.

a.—Road round the gardens, called the Inner Drive, or Circle.

b.—Road to Colosseum, &c.

c.—Road over the bridge to Marylebone Church, &c.

*** The several ornamental buildings will be devoted to study, refreshment, and amusement.

CONTRACTS.

GLASGOW and PAISLEY JOINT RAILWAY.—Contracts for Blocks and Rails.—The Committee of Management of the above line will meet at their office, 13, Gordon Street, on Thursday, October 4th, to receive TENDERS for 10,000 STONE BLOCKS, a description of which may be seen at the office, or will be sent to parties applying for it. Also, for 500 tons of MALLEABLE IRON RAILS, and 200 tons of Cast-Iron Chairs, agreeably to specifications, which may be seen at the office, or will be sent to parties applying for it. The Directors do not bind themselves to accept the lowest offer.

By order, (Signed) MARK HUISH, J. H. HUMPHREYS, } Secretaries.

Railway Office, 13, Gordon Street, Glasgow, Sept. 20.

LONDON and BRIGHTON RAILWAY.—Wood Sleepers and Stone Blocks Wanted.—The Directors of the London and Brighton Railway Company will receive TENDERS, up to the 11th of October, for a supply of Oak, Elm, Beech, Dantzic, Memel, or Riga Sawn Sleepers, nine feet long, ten inches wide, by five inches thick; also for Sleepers formed by a cut down a round piece of Beech, Larch, or Scotch Fir, nine feet long, averaging eleven inches diameter, but not less than ten inches diameter at the smallest end, free from bark.

The Directors will also receive Tenders up to the 11th of October next, for a supply of Stone Blocks, of Bramley Fall, Heddon, Whitehouse, or Roach Portland Stone, or Guernsey Granite, each block to be two feet square and one foot thick.

No Tender will be received for less than 1,000 Wood Sleepers or 5,000 Stone Blocks. Tenders to be addressed to the Directors of the London and Brighton Railway Company, 10, Angel Court, Throgmorton Street, London. Further particulars may be obtained on application to John U. Rastrick, Civil Engineer, 451, Charing Cross East, London.

JOHN HARMAN, Chairman.

London, Sept. 13.

CHELTENHAM and GREAT WESTERN UNION RAILWAY COMPANY.—CONTRACT for WORKS.—Notice is hereby given, That the Directors will meet at their Office, in Cirencester, on Tuesday, the 16th of October, at Twelve o'Clock, to receive Tenders for the following works:—

CONTRACT No. 1, Cirencester Division.—The excavation and formation of all the earthwork, and the construction of all bridges, culverts, and other masonry, and the entire completion (except the laying of the permanent rails) of that portion of the Cirencester branch extending from a point within a field marked 29 in the Parliamentary plan, in the parish of Cirencester, to the road No. 7, near the Windmill, in the parish of Kemble, being a distance of about three miles and seventy chains.

CONTRACT No. 2, Cirencester Division.—The excavation and formation of all the earthwork, and the construction of all bridges, culverts, and other brickwork and masonry, and the entire completion (except the laying of the permanent rails) of that portion of the main line, extending from a point at or near to the proposed junction with the Cirencester branch, in a field marked No. 2, in the parish of Kemble, to a point in the field marked No. 38, in the parish of Minety, being a distance of about four miles and ten chains.

Plans and Specifications of the above works may now be seen, and printed forms of Tender obtained, at the Railway Office at Cirencester.

The Directors do not consider themselves bound to accept the lowest Tender, and they expect the parties to attend at the Office, at One o'Clock, on Tuesday, the 16th of October.

A. MERRICK, Secretary.

Cirencester, 11th September, 1838.

CAST IRON WORK.

SEWERS'-OFFICE, Guildhall, 11th of September, 1838.—To Ironfounders and others.—The Commissioners of Sewers of the city of London and liberties thereof hereby give notice, that they will meet in the Guildhall of the said city, on Tuesday, the 9th day of October next, at 11 o'clock in the forenoon, to receive TENDERS for SUPPLYING the said Commissioners with CAST-IRON WORK for the term of three years, to commence on the 31st day of December, 1838, and to terminate on the 31st day of December, 1841. A specification may be seen on application at this office. The Commissioners do not engage to accept the lowest tender. Security will be required for the due performance of the contract. No tender will be received after 12 o'clock on the day of treaty.

JOSEPH DAW, jun., Principal Clerk.

TO ARCHITECTS, BUILDERS, PLUMBERS, and the PUBLIC.—WETTERSTEDT'S PATENT METAL.—This metal having been proved by extensive experience the best and most economical covering yet discovered for every description of roofing, the Patentees now offer it with increased confidence to the public. Manufactured only and sold wholesale by Young, Dowson, and Co., at their copper and metal works, Limehouse, from whom orders will receive immediate attention. Every sheet bears the stamp of "Baron Wetterstedt's Patent Marine Metal—Young, Dowson, and Co., Limehouse, sole manufacturers." A liberal allowance to exporters, plumbers, and all large consumers.

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GARDENS OF THE ROYAL BOTANIC SOCIETY IN THE REGENT'S PARK,

With a Plan.

Notwithstanding the manifest importance of a proper acquaintance with the productions of the vegetable kingdom, there is not, to this day, in the metropolis of the commercial world, a public establishment devoted to their general study; and while foreign countries possess such institutions, and there are forty in our own empire, we are the last to avail ourselves of their advantages. The benefits to be derived from a properly-directed botanic garden are so apparent that it argues an inconceivable deficiency in our local administration that they should be so long neglected. The only way in which the study of botany has received attention has been for medical purposes; and it is to be regretted that that knowledge should be considered as restricted to one profession, which is capable of still farther developement. The chemical properties of plants are not confined to their medical uses, but exercise important functions in manufactures; and indeed, when it is considered how little advanced is our acquaintance with their analysis, they should acquire a greater importance in our eyes, from their susceptibility of extended application in a more advanced state of science. The use of dye plants is but one of many chemical preparations; and the manufacture of sugar is a series of chemical processes. The employment of vegetable productions in textile fabrics makes them an object of commercial importance, and renders them deserving of scientific investigation; and the manufacturing properties of plants are so various as at once to open a wide field for observation and inculcate the necessity of it.

But if the study of the raw material have met with so little attention at our hands, there is another application of it to manufactures which has necessarily suffered still more in the general neglect. This is the application of the study of the external form of plants to the improvement of our arts and manufactures; and we need not be surprised if the effect of such neglect has been to leave them in a state of barbarism, as compared with the rest of Europe, unworthy of our position in the commercial world. Few points could be selected more strongly to show the intimate connexion which exists between all departments of the arts and sciences, and the ill effects which proceed from the non-cultivation of any of the series. In this case a complicated neglect is involved; and we find an equal want of attention to botany, the fine arts, and our true commercial interests. The consequence is, not only are we deprived of foreign markets, but we are unable to preserve our own from the inroads of strangers, and are subjected to the stigma of barbarism in the eyes of those to whose taste we are made captive by our own ignorance. The extent of this economical injury is twofold; first, as we are subjected to a positive loss by the importation of silks, cottons, velvets, papers, and jewellery, from France; clocks from Switzerland; bronzes from Italy; and Berlin ware from Prussia; but we contingently lose by our exclusion from foreign markets, which our other advantages would enable us to supply. The United States would undoubtedly prove a large customer for articles of taste, were we able to supply them with such productions, for which the congeniality of associations between the two nations would obtain a preference over any foreign rivals.

The adaptation of botanical subjects is the principal source of patterns for textile and imitative goods, and a facility for studying such objects is consequently the desideratum for the improvement of our manufac- tures. This has been recognised by every public body by which it has been investigated; and the evidence before the Select Committee of the House of Commons, on the State of Arts and Manufactures, affords abundant testimony of the necessity of this study.

Sir Charles Cockerell, the architect of the Bank, says—"As regards porcelain, foreigners are superior to the English in flower painting and ornamental scroll work."

Mr. George Rennie, the sculptor, attributes the excellence of the French artists to their superior facilities for studying design, and particularly recommends instruction in botanical drawing.

Mr. Crabb, an eminent fancy designer, says—"The French papers are superior in design, both in the original idea and the detail of the drawing; for in England we have no school to obtain such instruction. The foliage is beautiful and the flower borders are exceedingly well executed, while in the English patterns the leaves are not those of the flower, an inaccuracy which we never find in the French. This facility of adapting the forms and colours most gratifying to the eye, must be the result of early and continued acquaintance with flowers and plants. A botanical garden would be of the highest value, for there is scarcely anything where, in some form, botany is not introduced, and the more extensively we are acquainted with it the better; we get more beautiful lines, more original effects, and finer forms than we do by any other means; we find no colouring equal to that of nature."

Mr. Donaldson, the architect, says that the manufacturing artists require instruction, "in botany, as connected with construction, in order to give a workman an insight into the nature and properties of vegetable substances, and a more accurate knowledge of their forms when he wishes to delineate or model them; all which may be very much derived from the study of their growth and formation. I should also recommend, that such a general idea of chemistry, as connected with construction, should be given, as would enable a workman very usefully to apply that knowledge in respect to dry rot, and other similar circumstances, such as the various properties of colours, both mineral and vegetable, and their greater or less durability."

Mr. D. R. Hay, of Edinburgh, an able writer on the subject, gives testimony to the following effect:—"The vegetable kingdom presents the best examples for study, and a taste for ornamental design is not only to be acquired from the rare productions of the botanic garden, but both grace and elegance of form are to be found in the common dock, the thistle, the fern, or even in a stalk of barley. When students come to examine the ornamental remains of Athens and Rome, they will find themselves familiar with the source from which such designs were derived, for the ancients undoubtedly owed their excellence in ornamental art to the study of nature. Dr. Ure attributes the excellence of the French to the pursuit of art through the medium of nature."

The Chancellor of the Exchequer recently expressed himself in the House of Commons to the following effect:—"He thought it a disgrace to this country, possessing, as it did, so many colonies, and such vast means of collecting botanical specimens from all parts of the earth, that it should be without an extensive botanical garden, for the benefit of medical students and other scientific persons."

While the importance of botanical study is such in the lower walks of art, it is not of less necessity in its higher and more unequivocal branches. The delineation of the flower has in all countries afforded many fine paintings, a branch in which ladies have been particularly successful, and in which it was the pride of Rubens to excel equally as in the other departments of art. In all that relates to decoration, however, its application is of primary importance. Foliage is the basis of the arabesques of Pompei, and those of Giulio Romano; and, while an increasing inclination is exhibited for these styles among the patrons of art, the only true source of their power should not be neglected. The details of architecture have, even in the severest nations, derived their origin from this source, and the palm leaf of the Temple, and the lotus of Egypt, were not less favourite with their respective admirers than the variegated foliaged ornaments of the Greeks. These latter, in the acanthus and the honeysuckle, found a harmony and beauty which they made productive of the greatest effect, while the Gothic architects, in the profusion of their architectural enrichments, displayed even greater variety and research.

Although we, who are the most important commercial nation of the world, have been thus negligent in our metropolis, foreign nations, to whom botany is of far less pecuniary interest, have not been unmindful of encouraging its study. Whether for medical purposes, or for those purely scientific, or on a more extended scale, there is scarcely a town in Europe without its botanic garden, and the extent of these establishments, and the efficiency of some of them, is enough to cast shame on the negligence we have hitherto displayed. The garden at Padua appears to have been the first established in Europe, and was founded in the early part of the sixteenth century, and shortly after others were formed at Pisa, Florence, and Bologna. Since that period the progress has been such, that there is hardly a city in Italy without its botanic garden, although considerable difficulty is felt there on account of the necessity of supplying water by expensive irrigation. The Dutch early cultivated this department, and from the garden of Amsterdam sup-

plied the coffee plant, from which all those in the French colonies have been propagated. In France, the first establishment of this kind was formed at Montpelier in 1597; but, by far the best known, and the most important in Europe, is that of the Jardin des Plantes at Paris, founded in 1610. This institution merits particular notice, especially as it is a central one, and has long enjoyed the benefit of a regular administration. Its objects are twofold: first, to collect useful or remarkable plants from every part of the world, and to distribute them, as far as practicable, to every part of France, and to other countries; and, secondly, to form a school of botany and vegetable culture. Plants are brought to the garden from all countries by a universal correspondence; by particular naturalists, sent out at the expense of the nation; and by the general protection of the government, which allows entrance, free of duty, and generally carriage, free of expense, to all plants brought for the use of the garden, by whatever kind of vessel. Plants received in Paris are propagated without loss of time, and distributed to all the botanic gardens in France, and to such of the colonies where they may be useful; and, lastly, they are sent to foreign correspondents in return for similar favours. The provincial botanic gardens, of which there is at least one in every department, distribute them again among the eminent proprietors and cultivators in their neighbourhood. Instruction is given by lectures, to which the public are admitted, and by practical demonstrations. In Germany, botanic gardens are attached to every university, and in Austria the science has met with the greatest encouragement from the enlightened munificence of the sovereigns, who have neglected no opportunity of sending exploratory expeditions to collect plants. The garden at Berlin is esteemed the first in Germany. Those at Munich displays equal taste with the other foundations of the king of Bavaria. In Saxony and Wirtemberg are admired gardens; and this latter country possesses a private society of subscribers, of £1 each, for sending out travellers to collect plants in every part of Europe. In Switzerland there is a botanic garden in every canton. In Sweden, the establishment at Upsal is celebrated as having been under the direction of Linnæus. In Russia, the botanic garden of St. Petersburgh, containing sixty acres, is one of the largest in Europe, and is maintained with a munificence worthy of the scientific patronage of that empire. A considerable part of it is devoted to the cultivation of medicinal plants for the hospitals; and it is a central establishment for the use of the empire. In Spain, among others, is that of Madrid, containing forty-two acres, which, like the great garden of St. Petersburgh, cultivates medicinal plants. There are numerous other gardens in different parts of the world, as will be seen by reference to the statistical table annexed.

In our colonies the foundation of botanical gardens has been an object of government solicitude; nor has private enterprise been neglectful in promoting them in our own country. The two universities, Oxford and Cambridge, have botanical gardens; so also have Birmingham, Liverpool, Sheffield, Manchester, Leeds, Hull, Bury St. Edmunds, and Colchester; and they have been recently established at Cheltenham and Newcastle-upon-Tyne. In Scotland there are gardens at Edinburgh and Glasgow. In Ireland, at Dublin, is one belonging to Trinity College, and the splendid establishment at Glasnevin, of the Dublin Society; there are others at Cork and Belfast.

Having referred to the progress on the continent, and in our provinces, we shall in examining what has been done in the neighbourhood of the metropolis, find that there is sufficient encouragement to induce us to supply the deficiency. At Chelsea is a small garden of three acres, founded in the 17th century, and given in 1721, by Sir Hans Sloane, to the Apothecaries' Company, and devoted by them to the study of medicine, and of which they now contemplate the abandonment, if they can obtain a more suitable locality. Those at Kew have obtained considerable reputation, but are at too great a distance to be available to the great mass of the metropolitan population, while their system of management is far from being adequate to the requisites of a national institution.

That the public mind is prepared to support a botanic garden is evident by the progress of botany in every department. The number of scientific societies and floricultural exhibitions are proofs in themselves of the tendency of popular taste, while a greater developement is daily given to the culture of this science in the Zoological and public gardens, and cemeteries. As cultivators of the picturesque beauties of plants we stand in the highest position; and the English style in the decoration of gardens is that which is most prevalent on the continent, and most approved, while we stand in an eminent position with regard to the scientific study of botany by our authors and expeditions of discovery.

With such acknowledged advantages to be derived from the establishment of a botanic garden, and with such a tendency of public taste, it would appear surprising that such an object should have hitherto been neglected. This deficiency is now, however, to be supplied, and in such a manner as, it is to be hoped, will satisfy every votary of science. Although previous abortive attempts had been made to effect this object, the merit of it rests with several members of the Linnæan Society, whose success confers equal honor on the society by which it was promoted and on their enlightened exertions. On the suggestion of this undertaking, it was immediately supported by many nobleman and gentlemen, of every shade of politics, promoters of science, arts and manufactures, and they concurred in the propriety of requesting the assistance of Government. The inner circle of the Regent's Park being about to be vacated, they signed a memorial to her Majesty's Commissioners of Woods and Forests, requesting them to appropriate this site for such a laudable object. It confers the highest honour on this Administration, and on the members of her Majesty's Government, and is a high proof of their desire to encourage science, that they instantly acquiesced in the propriety of devoting the ground for these purposes to a public society, instead of making it the object of individual speculation. On this concession, a farther application was made for the patronage of Her Majesty and the Duchess of Kent; and, it is needless to say, that it was given with a generosity worthy of the illustrious personages and of the great public object concerned.

The names of the supporters of this society are a strong guarantee of its proper management, and we are happy to say that their expressed intentions are a good augury of the success of the institution. Its scientific objects are intended to be carried on in a manner commensurate with the dignity of the country, while it devotes an express attention to the encouragement of cultivation, arts, and manufactures. Public utility is the best guarantee of its success, and its promoters may feel assured, that keeping this object in view will always ensure it support. Even if a taste for such an institution did not exist, it is always the effect of well-directed efforts to create it; and how far these may be successful, we see in the impulse which is given to mechanical science by the Royal Gallery of Science and the Polytechnic Institution, which are absolutely creations of the last ten years, within which period botanical studies have acquired a still greater impulse.

The society will be constituted similarly to other scientific societies, and will be under the management of a president and council, and composed of fellows and members. It will, doubtless, be incorporated by Royal Charter, and its importance can hardly fail to obtain for it great influence; while the manner in which it is regarded by the Linnæan, Horticultural, and Botanical Societies, does honour to their enlightened liberality, and to the cause of science.

The site chosen is the inner circle of the Regent's Park, now occupied as Jenkins' nursery ground; its extent exceeds eighteen acres. That its position is eligible is best proved by referring to the neighbouring grounds of the Zoological Society, while its size is fully competent for the purposes intended. Many eminent gardens contain only three acres, while few exceed twenty, and where they do they are employed either in the cultivation of medicinal plants for the hospitals, or in the growth of fruit for the market. Its appropriation will be no encroachment on public enjoyments, while, if properly directed, it cannot fail to confer great advantage on the whole empire.

The artistical details of the plan, as shown in the accompanying drawing, are formed upon an observance of the most enlightened principles, and it has been the endeavour, in this department and in others, to make science and art equally conducive to the improvement of popular taste. This portion of the subject is deserving of particular attention, as it is by what is presented to the public eye that they will be induced to judge of the merits of the remainder. However interesting a mere planted surface might prove to the man of science, something more is requisite to the mere discursive visitant, and particularly to by far the greater proportion of its supporters, those who seek recreation rather than instruction. In fact, a due attention to objects of taste is imperative in an institution which must derive its chief support from the ladies, who are some of the most munificent patrons of this branch of science. We are but too apt to depreciate the moral effect of the pleasures of sight, although, it must be averred, most unphilosophically; for if it be allowed generally that that organ produces the most powerful impressions on the mind by its representations, so the influence exerted by it is susceptible of modifications, according to the nature of the objects presented to it. If the parks and gardens be the lungs

of the metropolis, their functions are but inadequately employed if they supply only pure air, without affording a means of exercise, for the sick man will die in the healthful shades of Montpelier or Madeira as easily as in the densest miasma; but the true means of securing the health of our population is by promoting the moral as well as the physical influence of exercise. The more interesting the garden be made, the more will its moral capabilities be augmented, and the effect of a well arranged establishment cannot fail to be of importance in restoring the tone of mind to the worn out senator, languid beauty, or over-worked citizen; for the mind requires its sustenance as well as the body, and there are as few maladies to be cured by abstinence from mental food as there are from corporeal. Such an effect cannot fail to be accompanied with an appreciation of the scientific advantages, and the attractions of such an institution might be made productive of the happiest results, in creating in the infant mind a taste for scientific pursuits.

The arrangement of this portion of the objects of the society has been confided to an architect possessing considerable taste and judgment in laying out ornamental grounds; and it is needless to say that he has complied with the utmost expectations of the enlightened promoters of the society. The geographical and physical distribution of plants is to be preserved as much as possible, and a necessary accessary is the application of national architecture in the buildings devoted to the production of individual countries. Other artistical decorations, as statues and vases, will also be employed as far as possible; and it is saying much in praise of the objects of the society, that only in this department, without going into any unnecessary expense, they may powerfully contribute to the cultivation of public taste. While the several ornamental edifices will present a synopsis of the various styles of architecture, a proper selection of statues and vases would afford all the benefit of a gallery or museum. This would give the public an opportunity of becoming acquainted with the best production of the several schools, and the elucidation of this object should be by no means omitted in the catalogue of the gardens. The selections might include casts of the several styles of Egyptian art, and of the finest ancient and modern specimens of the several Greek, Italian, French, and English schools. Whether these are classed in the general catalogue, or formed into a separate volume, the descriptions should contain sufficient information of the works and their artists, and the base of every figure should have inscribed the name of the artist, and date and style of the work.

The plants are to be arranged according to the two great systems of classification, the artificial and the natural; and will likewise be disposed in such a manner as may be useful to every class of botanist. The artificial system, or that of Linnæus, founded on the visible organs of plants, while it presents great facilities of reference, is too loose for any strict classification, and resembles the old method of animal arrangement, which in its definition of quadrupeds included in the same class of animals reptiles, and excluded cetaceæ. The natural system, formed by Jussieu, is founded upon the constitutional differences of plants, and establishes as clear a distinction between the several classes, as in animal tribes the distinction between warm and cold-blooded. The adoption of this latter system is of almost universal preference in all continental gardens founded upon improved principles, and is well calculated, by its introduction here to impress the student with the importance of studying the organic constitution of plants.

The circle is proposed to be distributed into compartments, for the reception of the several plants indigenous to Europe, Asia, Africa, America, Australia, and the Polar Regions. These again are proposed to be subdivided into gardens, in illustration of the style of ornamental gardens of the several countries of the great divisions.

At the entrance of the grounds from the grand drive leading from the Colosseum a building will be erected, devoted to the general business of the Society, and containing a library, museum, and rooms for study. The library will consist of botanical works and periodicals, and to it will be annexed a reading-room for the use of fellows and members. The museum will contain dried specimens, drawings, and engravings of recent plants, and specimens of fossils, and it would augment the value of these latter if they were accompanied by such recent plants as are identical to them, or have the nearest relation. It will farther contain illustrations of the application of vegetable productions to manufactures, as, for instance, specimens of cotton from the raw material up to its formation into cloth. The rooms for instruction will afford facilities for students to draw plants from the living objects, and it will include a convenient lecture hall, in which courses will be given similar to those which are so popular at the Jardin des Plantes at Paris, and the Royal Dublin Society's gardens at Glasnevin. From this edifice a raised viaduct promenade, overlooking a considerable portion of the gardens, will lead to a domed conservatory in the centre of the gardens. This conservatory will be on a very large scale, so as to emulate some of the foreign houses, and to give every facility for the growth of the more magnificent tropical plants. Descending from the conservatory to the right of the grand promenade, we [illegible] a garden laid out in the Dutch style, with a fountain in the centre, and canals. Beyond this will be a rosary, consisting of a circular lawn, surrounded by arched trellis-work and borders, for the growth of every variety of this queen of flowers. From this we enter the Italian garden, laid out with statues, fountains, and raised terraces, at one end of which will be a conservatory and at the other a casino. Having passed under the promenade, we reach the medico-botanical garden, adjoining the central conservatory, and surrounded by hothouses, stoves, &c. We are now at the head of the lake, which will extend for about a quarter of a mile, interspersed with islands and winding amid varied scenery. Here will be cultivated aquatic plants, and there will also be provided a salt-water basin for marine algæ. At the head of the lake will be an artificial rock for the cultivation of rock-plants, and which will contain a large reservoir to supply the several fountains and hydraulic works. The borders of the lake will, if possible, be so arranged as to display representations of natural geological sections, which may be made equally productive of interest and delight. A few of these sections would illustrate all the strata, from the primary upwards, and some of them, as the Alum Bay coast, with its variegated sands glittering in the sun, form highly beautiful objects. Mr. Niven, the superintendent of the Dublin gardens, proposed the exhibition of strata, with their appropriate plants growing on them; and this, where practicable, would certainly be of considerable interest. Around the shores of this lake will be arranged every variety of architecture, and on its borders will be seen the pointed arch of the Spanish Moor, and its kindred styles, the Turkish and the Persian kiosk, while by the side of these latter may be exhibited models of those interesting monuments, the Persepolitan remains. Farther on, the style of the Hindoo will again claim affinity with the pointed works of the Moor and the Goth, and the better known style of the Chinese will appear with its many-roofed pagoda. Between the lake and the central conservatory will be an extensive lawn, upon which ornamental shrubs and parterres of flowers will be displayed in the modern English style. In its special department will be a garden devoted, like that at Glasgow, to the cultivation of plants used in manufactures; and the dyer may here see the material of his tints, or the weaver the cotton from which his cloth is spun. In proper situations will be the American or bog-earth grounds; a fungi ground, shaded by trees, and containing stumps and roots of trees for the preservation of fungi; and tunnels and caves for the growth of mosses, ferns, fungi, and other vasculares. Around the whole ground is to be a walk with wide borders for the arrangement of plants in scientific order. By the sides of the walks raised receptacles may be placed, so as to bring some of the more delicate bog-earth plants nearer the eye.

An experimental garden may be rendered an important and interesting object, whether devoted to agriculture or manufactures. Professor Daubeny has devoted a portion of the limited space of the garden at Oxford to a series of experiments on the powers of agricultural plants, by which he endeavours to ascertain how long a plant will continue in constant cultivation before it exhausts the soil, and when one plant has exhausted the soil, what other will grow in its place. The rotation of crops, the subject of this examination, is one of the most important principles of modern agriculture, and one which greatly demands enlightened study.

By these several departments every facility will be given for the study of botany to whatever class of student may be desirous of availing himself of it; and one of the most important objects, the application of botanical productions to arts and manufactures, is particularly provided for. As far as means will permit, exertions will be made to promote the cultivation of such plants as may be most useful for these purposes, and to extend them in our own country and our colonies; and even if the society should do nothing locally, they have it in their power to further these objects, by giving prizes, as is done by the Society of Arts. To give every inducement for its local study, public botanical exhibitions will be opened periodically, in which an important feature will be introduced, by giving prizes for any new application of plants to manufactures, and for the best delineation of them, or combination in a pattern. It is gratifying to perceive that it is the intention of the society to act like the institutions at Paris and St. Petersburgh, as a central establishment, to form a union with provincial societies, and to afford every assistance to them and to individuals in the propagation of new plants.

The most effective way to render the gardens of advantage to the public is to devote great attention to everything that can promote its utility, and the simpler and more effective all its arrangements are made the more it will effect this end. A very important object is the placing the names of the plants near them in a conspicuous position, and such description should contain their scientific and common names, their country, and what are their economical uses. The catalogue should be as extensive and cheap as possible, and contain, in addition to the history of the plant and its particular uses, a chemical analysis of its several constituents; to this work should be prefixed a short explanation of botanical terms and the rudiments of the systems. Another necessary feature should be always, as far as possible, to accompany the description and the catalogue by analysis of the several soils in which the plants are placed, as this would call public attention to a department of science which is highly important, and in which, notwithstanding the efforts of Kirwan and Davy, we are still greatly deficient.

Having thus exhibited the general features of this plan, it is hardly necessary to augur its success, as that cannot fail to attend an object of such great interest and utility. We have sufficient evidence in the taste for floriculture, and the increasing cultivation of zoological and botanical science, that the public mind is sufficiently prepared for such an institution, and is perfectly capable of appreciating and supporting it; and if we wanted an instance of popular discrimination on this subject, we have a most admirable instance in the case at Dublin. The gardens of the Royal Dublin Society having been much neglected, gradually declined in public estimation; but, in 1834, no sooner was an improved system adopted, than the lectures were crowded, and the number of visitors increased, in four years, from 7,000 to 20,000. That no improvement is lost on the public mind, we see again in the effect produced by the new regulations in the national collections in London, where every change for the better has produced a corresponding increase in the number of visitants.

In conclusion, the managers have but to follow in the course they have commenced, and the success of their institution will reflect equal lustre on themselves and advantage on their country, and redeem the honour of the giant metropolis from the deficiency of such an important embellishment. Its promoters may rest assured that it is only by enlightened management that these objects are to be obtained, while through it the enjoyments of their fellow-countrymen may be promoted, and the greatest advantages conferred on the arts, sciences, commerce, and manufactures of their native land.

We have annexed a statistical account of all the principal botanic gardens in the United Kingdom and throughout the world, to show their relative size, number of species cultivated in them, their system of classification, and to what purposes they are adapted.

STATISTICS OF VARIOUS FOREIGN AND COLONIAL BOTANIC GARDENS.

NAME.	Date of Foundation.	Size in Acres.	No. of Species.	System of Classification.	Purposes.
Leyden (A)	1557	7	8,000	—	Sc. M.
Brussels	—	—	2,000	N.	Sc.
Ghent	1800	3	7,000	A.	M.
Paris (B)	1610	—	7,000	N.	Sc. M. C.
Montpelier	1597		4,000	N.	—
Rouen	—	2	—	N.	—
Spire (C)	—	—	5,000	—	—
Ratisbon	—	1	Few.	A.	M.
Carlsruhe	1715	—	7,000	—	—
Munich (D)	—	—	3,000	A.	—
Cologne (E)	—	—	4,000	—	—
Copenhagen (F)	1600	5	8,000	A.	M.
Upsal	1657	8	8,000	A.	M.
Lund	1740	2½	2,300	A.	M.
Christiana (G)	1812	7½	—	A.	—
St. Petersburgh (H)	1824	60	11,000	N. & G.	Sc. M. C.
Dorpat	—	—	14,535	—	M.
Warsaw	—	15	10,000	N.	—
Madrid (I)	1755	42	6,000	—	Sc. M. C.
Cadiz	—	3	Few.	—	M.
	—	2	—	—	C.
Valencia	1790	27	—	—	—
Barcelona (J)	1790	30	—	A.	C.
Muchamiel	—	—	2,000	—	—
Penacerrada	1818	—	2,500	—	—
Lisbon	—	2	—	—	—
Cape of Good Hope (K)	1700	19	—	G.	C.
Bourbon	—	14	5,000	N.	C.
Calcutta	—	—	3,500	—	C.
New York (L)	1800	20	4,000	—	C.
Rio Janeiro	1809	50	—	None.	C.

(A) Four acres are devoted to a medical garden.
(B) The Paris garden is also devoted to zoology, and the annual outlay is 12,000*l.*
(C) The number of plants at Spire is 24,000.
(D) At Munich is another garden.
(E) At Vienna are several botanic gardens.
(F) The income at Copenhagen is 685*l.* per annum, and at Lund 50*l.*
(G) At Stockholm there are two gardens, one of which is attached to the Veterinary College.
(H) The cost of the St. Petersburgh garden has been 50,000*l.*, the income 10,000*l.* per annum, and the number of plants 80,000.
(I) The income is 1,900*l.* per annum.
(J) At Barcelona are two.
(K) At the Cape is another belonging to the South African Institution.
(L) The cost of the gardens at Charleston was 15,000*l.*

The columns show the name, date of foundation, size in acres, number of species cultivated, system of classification, and the purposes to which devoted. If arranged entirely according to the artificial or Linnæan system, it is expressed by the letter A; if partially, according to the natural or Jussieuan (N); if geographically (G). The purposes to which devoted express whether scientific (Sc), medical (M), horticultural (H), or for the cultivation of plants used in commerce and manufactures (C). The greater portion of the gardens in Russia and Spain is used to grow drugs for the hospitals, and those in Spain also cultivate fruit for sale. This accounts for the large size.

It will be seen by the above that the size for a general botanical garden is from 15 to 20 acres, and for a medico-botanical garden two to three acres. In most of the preceding, professors are attached and lectures are delivered.

BOTANIC GARDENS IN THE UNITED KINGDOM.

NAME.	Date.	Size.	No. of Species.	System.	Purpose.	Income.
Chelsea (A)	1650	3	—	A.	M.	
Horticultural, Chiswick (B)	—	33	—		H.	£6,500
Kew (C)	1760	—	10,000	—	Sc. H.	
Oxford (D)	1632	5	3,000	N.	Sc. M.	
Cambridge	1761	3½	9,000	—	Sc. M.	
Liverpool (E)	1801	6	6,000	—	Sc.	
Bury	1820	9	—	A.	Sc. H.	£350
Manchester (F)	1830	17	—	A.	Sc. H.	£1,443
Birmingham (G)	1831	16½	3,000	A.	Sc. H.	
Sheffield	1836	17½	—	N.	Sc. H.	£1,900
Edinburgh (H)	1680	16	5,000	A.	Sc.	
Glasgow	1817	8	9,000	N.	Sc. M. C.	
Dublin	1786	3½	5,000	N.	M.	
Do., Glasnevin	1796	16	5,000	N.	Sc. C.	£1,020

(A) Chelsea belongs to the Apothecaries' Company; it is proposed to be given up.
(B) The cost of Chiswick is 17,000*l.*
(C) Kew is supported by a government grant.
(D) Oxford and Cambridge are both endowed.
(E, F, G) Liverpool, Manchester, and Birmingham have each 500 annual subscribers. Liverpool cost 13,300*l.*, Birmingham 13,000*l.*, and Sheffield 18,562*l.*
(H) At Edinburgh are also the gardens of the Caledonian Horticultural Society, founded in 1809.
(I) The whole extent of the grounds at Glasnevin are 30 acres; they are thrown open to the public, and the lectures are also gratuitous.

The other botanical gardens are—Hull, founded in 1802; York, in 1822; Colchester; Leeds, which cost 10,000*l.*; Cheltenham, in 1837; Cork and Belfast, 1830.

Lectures are delivered at Chelsea, Oxford, Cambridge, Edinburgh, Glasgow, Dublin, Glasnevin, Cork, and Belfast.

The general outlay in establishing a botanic garden is from 15,000*l.* to 20,000*l.* The number of annual subscribers in a population of 200,000 is about 500.

Besides these 22 botanic gardens there are as many more in the other parts of the English empire, most of which are splendid establishments, supported by the colonial authorities. There are, one in America, three in the West Indies, four in Africa, eight in the East Indies, and two in Australia.

The following is an account of the collections attached to some botanical institutions. The herbarium of the British Museum is the second in the world:—

Name.	No. of Plants in Herbarium.	No. of vols. in Library.
Paris	50,000	—
Madrid	30,000	2,000
Cadiz	—	1,000
British Museum	45,000	—
Oxford	25,000	2,000
Liverpool	—	300

REVIEWS.

Papers on subjects connected with the Corps of Royal Engineers. Vol. II. 1838.

In our second number we reviewed the first volume of these Transactions, and we felt it to be our duty to express how little we thought that it was worthy of the scientific attainments of the members of that distinguished corps; our military brethren, however, have now come into the field with the second volume of their Transactions, and we are happy to bear testimony to the merits of their exertions, which keep pace with the spirit of enlightenment which prompted the work. It is evident that the march of improvement is abroad in this quarter as well as in others; and the interest taken by the engineers in the advancement of their branch of study, cannot fail to operate upon the other departments of the army. The preface to the work gives some able remarks on the importance of engineering knowledge to every officer; a fact which, we believe, is recognised in all services but in this. With our extensive sea coasts, and detached territories, it would appear to a cursory observer, of the first importance that an officer in command should be able as fully to avail himself of the physical means under his controul, as of the human or mechanical force. The editor observes very truly, that the study of fortification is not so abstruse as is believed by the generality of the profession, and that the acquisition of it may be obtained with comparatively little exertion. This is perfectly true, for to obtain a competent knowledge how to erect field works, by no means requires the extensive studies which are necessary in laying out a strong place; we believe, however, that this erroneous impression has been created very much by the engineers themselves, who by their disputes about Vauban and Belidor, the perpendicular or the circular systems, frighten the novice from a study which seems to have as many systems as writers, and to be in a more unsettled state than even cosmogony. Sound judgment has more to do with fortification than all the books that have ever been written, which, were they ten thousand, would fail in affording plans for every variety of nature. We think that a knowledge of fortification might be extended farther than to the military profession generally; for we consider that it might very advantageously form an adjunct to the studies of the civil engineer. Such a practice would greatly increase the military capabilities of the nation at large; and its advantage will be fully evident by recurring to such periods as the threatened invasion in the last French war. The efficiency of the civil engineers would in any such event be very great, as their local knowledge of the country, and their practice of dealing with it, would be equally available with their experience in the construction of works. It has been the practice of governments to deprecate military knowledge in the people; but we are far from being persuaded that in this instance it would be wise to deprive the country of such auxiliaries so important on an emergency.

Among the papers there is necessarily much that is merely military, while some are exclusively philosophic; but still the subjects which are of practical bearing on our own department are so numerous, that we can only regret that it is not in our power to avail ourselves fully of all that we should desire to lay before our readers. In the papers on mines and breaches there is much interesting matter on the destructive power of gun-powder, and particularly in that on the demolition of the Glaciere Bastion at Quebec. The memoir on the fortifications of Western Germany shows a research which is of the most laudable nature, but of which, not being in our own department, we cannot avail ourselves. A long article on contoured plans and defilades, by Lieut. Harness, is not confined in its interest to the military reader, but may be read with advantage by many others; it treats on the delineation of the surface of a country on paper, and contains many good points. The reports on the South Union and the Brighton Railways are too well known to need repetition.

The paper on the dams of the Rideau Canal, by Captain Alderson, details the different modes used, and gives an account of their failures. This paper shows that, in Canada, the government authorities have been led into the danger of following a bad American practice. Instead of the works being as in Europe planned by the Engineer, and executed from his drawings, the contractor offers a plan and estimate, according to which he proposes to do the work, and in the event of his failure, he loses his contract and money expended. It need scarcely be observed, that the effect of such arrangements is to cause repeated failures, and the least inconveniences sustained are protracted delays, and unnecessary outlay. It is well known that nothing is more dangerous than for a man to unite two trades; in fact, it is contrary to the principle of the subdivision of labour; and if, in this country, such attempts fail, we need not wonder at the inconvenience they cause in Canada. If such a system is adopted by the government, from misconceived notions of economy, we can only recommend them to look to the results, and they will find that, however a half-witted speculator may be willing to tamper with his delusions, the consequences to the authorities must be vexation, delay and disgrace.

Captain Sandham, gives some useful information respecting the formation of jetties, in a communication on the coast defences of Holland; he also advocates the advantage of building scarp walls with a curvilinear batter to sustain the action of the sea.

In a memorandum on the repair of the Brighton Chain-pier, Major Piper makes the following remarks on the lateral pressure of the wind:—

The lateral pressure on the side elevations of the bays (the vertical one being always consequent upon it) is the worst that can be received from the course of the wind; and as it appears to have been a principal cause, if not the only one, of all the hazardous movements of the superstructure, should another equally severe gale of wind take place before other checks than those which have been added be applied, it is very possible a repetition of the disaster will take place, against which every precaution should be taken. As a limit should be given to this description of dangerous motion (flexibility being necessary only to the extent of preserving the work from fracture by any sudden strain, from whatever direction), it seems therefore advisable, that every bridge or arch built upon the suspension principle, should be furnished with guide or check-chains, to counteract the effect of the pressure of the wind in a lateral direction, which should there be applied, in addition to the chain intended, to check the motion in a vertical direction.

On the 17th October (present year), the repairs having been completed, a heavy rolling (spring tide) sea,* impelled by a tremendous gale of wind from the westward, came pitching on to the shore with the flow, at the rate of nearly 16 knots; and as many of the waves, previous to their discharge, lifted to an average height of 13 feet over and above the usual high-water mark, breaking violently at intervals over the whole length of roadway, the binding chains and segments may be said not only to have had a fair trial, but to have answered their purpose; yet the constant tugging and pressure, from the effects of the wind, along the whole communication, was so great as to throw the section into a complete state of winding, giving it the appearance of being in distress; wherefore, if the pressure of the wind, in so unfavourable a direction, be taken into consideration (supposing the same to be from the flow of the scud, at a moderate calculation, about 4lb. the square foot, which it must have been,) a fair inference may be drawn as to what a work of this nature has to contend with; and as every season must also tend to weaken its foundation, as well as loosen the pile work, it is evident accidents will happen, and it is only matter of surprise they have not occurred more frequently.

Lieut.-Col. Reid contributes further observations on the moving of the shingle of the beach along the coast, and describes the nature of a great part of the coast on the British Channel. The following observation is an answer to the mistaken ideas which prevail as to the supposed great height to which waves rise:—

The observations on the effect of the waves in this paper apply to breakers on the coast, and not to undulations in deep water, for the water in them is said to have no progressive movement, but only a vertical one.

In ordinary gales of wind at Brighton, in the winter of 1836, the undulations of the waves measured twelve feet high; and they proceeded towards the shore at the rate of twelve miles an hour.

In the winter of 1837, Captain Alderson observed them, in gales rather more severe than the year before; and the waves measured 12½ feet high, and the undulations proceeded at the rate of eighteen miles an hour.

We differ in opinion from the Colonel, respecting the stopping of the progress of the shingle, as we expressed in our notice of Lieut. Worthington's work on Dover Harbour. The Colonel observes, with regard to this latter plan,—

The direction of the line of coast, with reference to the prevailing gales, seems to determine where the shingle will accumulate, or where the sea will be most likely to encroach upon the land; and seems to be one of the most important points to study, as regards the subject of opening bar-harbours.

It well deserves consideration, whether embankments (on the south coast of England) run out on the eastward of bar-harbours, in a line parallel to the line formed by nature on the east side of Portsmouth Harbour, would not lead to a similar effect as that produced there in keeping open one principal channel. By a proper system of groins on the west side of such harbours, shingle coming from the westward would be stopped, and much of the materials which now form the bars might be arrested in their course.

The slope of the beach is flatter after a southerly gale, and its average slope is about 1 foot in 9.

If groins are not carried far enough in-land, the sea in south-west storms

* The time between the rising, reach, and dispersion of each wave, was averaged by a stop-watch at 10 seconds, and the distance passed over 250 feet, giving a velocity of 17 miles per hour. Desultory waves broke heavily and with effect at 15 and 16 feet, threatening to tear up the platforms of the towers; and had the wind shifted to the south or west, with the increased send which would then have been given to the swell, the scene of last year would most likely have been repeated.

(on the south coast) will break round and insulate them. If they are not high enough at high-water mark, the gravel will be carried over them to the eastward; and if they are too short, it will pass round the outer end of them.

During southerly gales, it is frequently said, that the gravel is "carried into the sea," because the receding waves draw it down; but it is again driven back, and if the wind be south-west it is set to the eastward.

Lieut.-Col. Reid also contributes an elaborate article on hurricanes. The articles on the construction of barracks in the West Indies, are well worthy of the attention of those who devote attention to architectural hygiene. Colonel Pasley considers another department of internal economy in an examination into the modes proposed for curing smoky chimneys. He observes on Captain Sandham's plan:—

Fig. 1 represents this arrangement, and so far as the plan alone of the fire place is concerned, it does not appear to differ much from Count Rumford's system; but in fig. 2, which is the elevation, and in fig. 3, which is the section of the same, it will be observed, that not only the sides, but the upper part of the back of the fire-place also, are coved on Captain Sandham's system. Below this top coving is the mouth of the chimney, as it may be termed, being a rectangular opening, 9 inches wide and 6 inches high, above the level of the hobs of the grate, into which the smoke from the fire first enters as it rises, in a direction almost horizontal, and then changing its course, ascends vertically by the throat of the chimney into the flue. The appearance of this aperture, viewed from the room, is shown in figure 1. In some other fire places its width has been reduced to 8 inches.

Fig. 1. Plan.

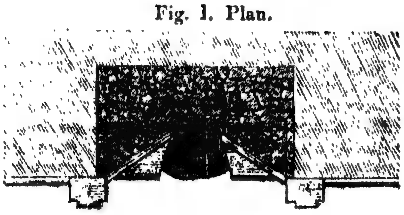


Fig. 2. Elevation.

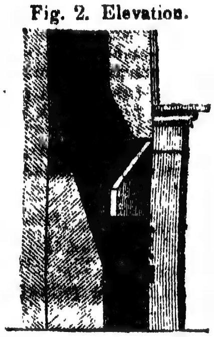
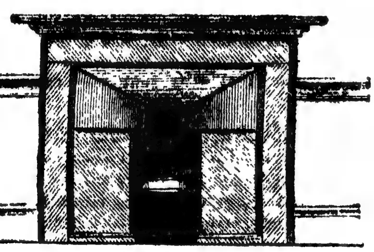


Fig. 3. Section.



The smoke ascending through the mouth and throat of the chimney, may be compared to water flowing through a strait, leading suddenly into a sort of gulf or much larger channel; for in this fire-place, after raising the sides and back, within and behind the side covings and grate, a little higher than the mouth of the chimney, the filling in behind the side covings, as well as behind the position of the back of the grate, terminated abruptly, without being rounded off; thus, whilst the side covings were not quite so deeply recessed, at Count Rumford's, every thing else agreed with his rules, excepting that the Count had no top coving.

In Sandhamizing our fire-places in Brompton barracks, we formed our covings with paving-tiles a foot square, cut to the required splays; and one of these tiles over the centre of the throat of the chimney was made to take out, having been placed dry, and the joints towards the room not flushed, but only pointed with cement, so that it is moveable when the chimney requires sweeping.

I have already given one instance of the importance of Count Rumford's rule, "that after reducing the throat of a chimney the work should terminate abruptly a little above that level." Several other proofs of the necessity of this maxim occurred in the course of our alterations; for the bricklayers in two or three instances thought proper, of their own accord, to slope up both the back and sides, above the throats of our Sandhamized fire-places, in order to make a neater finish, and also from a natural desire to make it stronger; and thus they produced that sort of trumpet-mouth above the throat of the chimney which the Count reprobated; in consequence of which all those fire-places still continued to smoke a little; but on altering them once more, by removing all the extra filling in, so as to restore abruptly the large rectangular opening of the original brick-work, forming a sort of gulf immediately above the throat of the chimney, this evil was remedied; and none of these chimneys now smoke, even in the most violent gales of unfavourable wind, excepting by emitting small puffs occasionally on lighting the fire, which cease when it burns clear.

Of all the fire-places that have been Sandhamized properly, with due attention to the position of the grate and to the above maxim, only one still smokes in westerly winds, which is that of a servant's room in the attic story, over my office; and as the office itself has been completely cured, the difference must be ascribed to the flue in the attic story being much shorter, which always causes a tendency to smoke,

As compared with Count Rumford's system, I conceive that the top coving of Captain Sandham's improved fire-place is a great advantage, inasmuch as it brings the throat of the chimney nearer to the fire, without the inconvenience of allowing too much of the heated air to pass up the flue; instead of which it throws out much more heat into the room than when the back is upright, as every one acknowledges, who has been in the same rooms, before and after the fire-places were Sandhamized.

In relation to the improved chimneys in the Anchorsmiths' shops at Chatham, the Colonel remarks—

Captain Sandham has not yet tried his system for curing the chimneys of smoky kitchens, to which, from the space required for the cooking apparatus, it may be more difficult to apply it; but the remarkable improvement in the fire-place of the anchorsmiths' shop in her Majesty's dock-yard at Chatham, which was effected many years ago by the late Mr. Perkins, then master builder, nearly on the same principle recently adopted by Captain Sandham, gives reason to hope that it may do good even in kitchens. The large rectangular hearths, on which the anchorsmiths made the fires for heating their irons, were formerly entirely covered with very large hoods, into which the smoke was expected to rise vertically, and be discharged at the top of the flues or chimney-shafts, of which these hoods formed the bottom, instead of which the greater part of the smoke spread over and filled that large room. The improvement made by Mr. Perkins consisted in removing these hoods entirely; instead of which he built flues at the back of the several hearths, each having a rectangular opening into it a little higher than the hearth, to which it bears the same relation as the opening in the back of Captain Sandham's fire-place does to the grate. For the larger fires required for the heaviest work, these openings are about 18 inches high, and about 4 feet 6 inches wide, whilst the depth of the flue, measured from front to rear, is 2 feet in the clear; and there is only one flue of this sort in each chimney shaft. For the smaller fires, suited to light work, there are two flues to every shaft, the entrance into which measures about 15 inches high and about 2 feet broad, the depth of the flue at this part being 13 or 14 inches. The fires in the anchorsmiths' shop, made upon the several hearths, are all by this arrangement placed entirely in front of, and not under, any part of their respective flues; and yet the smoke, instead of rising vertically, and filling the whole of this spacious workshop, rushes apparently out of its natural direction into the openings at the bottom of the flue. This ingenious alteration proved so extremely beneficial, by diminishing the quantity of smoke, that the anchorsmiths addressed a letter of thanks to Mr. Perkins, signed by the whole of them, in which they declared, that they were convinced that it might be the means of prolonging their lives.

The concluding observation affords a full reply to many triflers, who would be rather inclined to treat such a subject as a matter of ridicule, than to recognise the importance of any thing which affects human health. At the end of the volume, Lieutenant Denison, the Editor, contributes an account of experiments, which he modestly styles "Notes on Concrete," to which we intend to refer on a subsequent occasion. Captain Alderson supplies a memorandum on paving stables, which is highly deserving of attention, and it would be productive of much benefit if his brother officers were to communicate in the same manner the different modes of construction which fall under their notice.

Having given such an extensive view of the work, it [illegible] unnecessary for us to dilate upon its merits; we leave it to our readers to speak for itself, and can only say that it reflects equal credit upon the spirit and intelligence of its supporters.

Guide Pittoresque de Paris à Saint Germain par le Chemin de Fer. With Maps and Plates. Paris, 1837: Didot. 8vo., 20 pp., price 5d.

Notice Historique sur St. Germain en Laye, Itineraire par le Chemin de Fer. Paris, 1838: Bocquet. 24mo., 140 pp., price 6d.

We have thought proper to notice these works, as some people like to know how they do these things in France. The St. Germain railway created a greater sensation at Paris than our Greenwich line did here; and a proof of the interest taken in it is afforded by the circumstance that one of the first booksellers in France thought it worth his while to publish a work on the subject.

Both these works are necessarily on a small scale, and are cheap. They contain the usual quantity of topographical matter, and give a history of railway communication elsewhere. The first is preferable for the care with which it is got up, while the second work is a genuine French production, full of magniloquence, and the joint essay of two literators.

From them we learn that the St. Germain line was sanctioned by the legislature on the 9th July, 1835, and was opened on the 25th August, 1837; that it is eleven miles and three-quarters long, and conveys 3,000 passengers on week days, and 18,000 on Sundays.

A Dictionary of Arts, Manufactures, and Mines. By ANDREW URE, M.D. London: Longman, 1838. Part II.

We have now to lay before our readers our observations on the Second Number of this valuable compilation. A considerable part of it is occupied with the articles on bleaching, dyeing, and printing, which give a great deal of useful English and foreign information on the subject; it strikes us, however, that more details could have been given as to the French black dyes.

After giving an account of the several economical applications of bitumen or asphalte, and of its several localities, to which might have been added Neufchatel, the following detail is given :—

Bituminous mastic, or cement, has been of late extensively employed in France for covering roofs and terraces, and lining water cisterns. The mineral bitumen used for the composition of this mastic is procured chiefly from the Obsann (Bas-Rhin) [query, Lobsan], from the Parc (department de l'Ain), and from the Puy-de-la-Poix (department of Puy-de-Dome). But boiled coal-tar answers equally well. In the neighbourhood of these localities there is a limestone impregnated with bitumen, which suits for giving consistence to the cement. This is well-dried, ground to powder, sifted, and stirred while hot in about one-fifth its weight of melted asphaltum, contained in a cast-iron boiler. Dry chalk or bricks, ground and sifted, will suit equally well. As soon as this paste is made quite homogeneous, it is lifted out with an iron shovel or spoon, and spread in rectangular moulds, secured with pegs at the joints, fastened to a kind of platform of smoothed planks, covered with strong sheet-iron. The sides of these moulds should be previously smeared over with a thin coat of loam paste, to prevent their adhesion to the mastic. Whenever the cake is cold, the frame is taken asunder, and it is removed from the iron plate by an oblong shovel, or strong spatula of iron. These cakes or bricks are usually 18 inches long, 12 broad, and 4 thick, and weigh about 70lbs.

The article on blocks is highly interesting, as it describes the several processes adopted in the manufacture by Brunel's automatic machinery in Portsmouth dockyard.

The article devoted to bones, will be found deserving of the attention of our chemical friends, as it points out a strong case of the mechanical operations of chemistry in the difference between bone black and vegetable charcoal, the former, although equally a carbonate, possessing greater purifying power from its property of taking lime in solution. There are also some good remarks in it on substitutes for charcoal.

The interesting account of bookbinding does not range itself among our class of subjects, but we can recommend to the notice of our readers the articles on brass and bronze; under the latter head the following processes are communicated :—

Statues, vases, bas-reliefs, and other objects made of gypsum, may be durably bronzed, and bear exposure to the weather better than after the ordinary oil varnish, by the following process :—Prepare a soap from linseed oil, boiled with caustic soda lye, to which add a solution of common salt, and concentrate it by boiling, till it becomes somewhat granular on the surface. It is then thrown upon a piece of linen cloth, and strained with moderate pressure. What passes through is to be diluted with boiling water, and again filtered. On the other hand, four parts of blue vitriol and one part of copperas are to be dissolved separately in hot water. This solution is to be poured slowly into the solution of soap, as long as it occasions any precipitate. This flocculent matter is a mixture of cupreous soap and ferruginous soap, that is, a combination of the oxides of copper and iron with the margaric acid of the soda soap. The copper soap is green, the iron soap is reddish brown, and both together resemble that green rust which is characteristic of the antique bronzes. When the precipitate is completely separated, a fresh portion of the vitriol solution is to be poured upon it in a copper pan, and is made to boil, in order to wash it. After some time the liquid part must be decanted, and replaced by warm water for the purpose of washing the metallic soaps. They are finally treated with cold water, pressed in a linen bag, drained and dried. In this state the compound is ready for use in the following way :—

Three pounds of pure linseed oil are to be boiled with twelve ounces of finely-powdered litharge, then strained through a coarse canvas cloth, and allowed to stand in a warm place till the soap turns clear. Fifteen ounces of this soap-varnish, mixed with 12 ounces of the above metallic soaps, and five ounces of fine white wax, are to be melted together at a gentle heat in a porcelain basin, by means of a water bath. The mixture must be kept for some time in a melted state, to expel any moisture which it may contain. It must be then applied, by means of a painter's brush, to the surface of the gypsum previously heated to the temperature of about 200 deg. F. By skilful management of the heat, the colour may be evenly and smoothly laid on without filling up the minute lineaments of the busts. When, after remaining in the cool air for a few days, the smell of the pigment has gone off, the surface is to be rubbed with cotton wool, or a fine linen rag, and variegated with a few streaks of metal powder or shell gold. Small objects may be dipped in the melted mixture, and then exposed to the heat of a fire till they are thoroughly penetrated and evenly coated with it.

In the long and valuable treatise on bread, we are surprised that no notice is given of the *grano duro* or other wheats of Sicily, which possess superior qualities, and are so extensively employed in the manufacture of macaroni and ot[illegible] productions.

Under the head of Bricks, although there is a pretty long account of the subject, we notice the omission of several late improvements—as those of the Marquis of Tweedale, Smart, and others. It strikes us, too, that there must be some error in the statement of the French brickmakers moulding 9 or 10,000 bricks in a day, and a discrepancy as to two or three inches of breeze being laid between each layer of bricks to be burned in the clamps.

The account of the button manufacture we find approved even in Birmingham; but although it relates several ingenious mechanical processes, it does not lie exactly within our domain.

There is a valuable article on chain cables, from which we wish we could extract at greater length. We must observe that, in stating the invention of Captain Brown, it should be noticed, that although he was then in the merchant service, he is also a commander in the Royal Navy.

Strength of iron cables compared with hemp cables :—

Iron Cables. Diameter of Iron Rod.	Hemp Cables. Circumference of Rope.	Resistance.
Inches.	*Inches.*	*Tons.*
$0\frac{7}{8}$	9	12
1	10	18
$1\frac{1}{8}$	11	26
$1\frac{1}{4}$	12	32
$1\frac{5}{16}$	13	35
$1\frac{3}{8}$	14 to 15	38
$1\frac{1}{2}$	16	44
$1\frac{5}{8}$	17	52
$1\frac{3}{4}$	18	60
$1\frac{7}{8}$	20	70
2	22 to 24	80

It would be imprudent to put hemp cables to severer strains than those indicated in the preceding table, drawn up from Brunton's experiments; but the iron cables of the above sizes will support a double strain without breaking. They ought never, in common cases, however, to be exposed to a greater stress. A cable destined for ships of a certain tonnage, should not be employed in those of greater burden. Thus treated it may be always trusted to do its duty, and will last longer than the ship to which it belongs. A considerable part of this decided superiority which iron cables have over hemp ones, is undoubtedly due to the admirable form contrived by Brunton. Repeated experiments have proved that his cables possess double the strength of the iron rods with which they are made—a fact which demonstrates that no stronger form can be devised or is in fact possible.

Vessels furnished with such cables have been saved by them from the most imminent peril. The Henry, sent out with army stores during the Peninsular war, was caught on the northern coast of Spain in a furious storm. She ran for shelter into the Bay of Biscay among the rocks, where she was exposed for three days to the hurricane. She possessed fortunately one of Brunton's 70 fathom chain cables, which held good all the time, but it was found afterwards to have had the links of its lower portion polished bright by attrition against the rocky bottom. A hemp cable would have been speedily torn to pieces in such a predicament.

In the contracts of the Admiralty for chain cables for the British navy, it is stipulated that "the iron shall have been manufactured in the best manner from pig iron, smelted from iron-stone only, and selected of the best quality for the purpose, and shall not have received in any process whatever subsequent to the smelting, the admixture of either the cinder or oxides produced in the manufacture of iron; and shall also have been puddled in the best manner upon iron bottoms, and at least three times sufficiently drawn out at three distinct welding heats, and at least twice properly fagotted."

The following is a table of the breaking proof of chain cables, and of the iron for the purpose of making them, also of the proofs required by her Majesty's navy for chains :—

Size of Bolt.	Proof of Bolt.		Proof of Chain.		Navy Proof of Chain.
Inches.	*Tons.*	*Cwt.*	*Tons.*	*Cwt.*	*Tons.*
$\frac{1}{2}$	5	7	8	11	$4\frac{1}{2}$
$\frac{5}{8}$	8	7	13	4	$5\frac{1}{2}$
$\frac{3}{4}$	12	1	19	5	$10\frac{7}{8}$
$\frac{7}{8}$	16	4	26	5	$13\frac{3}{4}$
1	21	8	34	5	18
$1\frac{1}{8}$	27	2	48	15	$22\frac{3}{4}$
$1\frac{1}{4}$	[illegible]	10	53	11	$28\frac{1}{8}$
$1\frac{3}{8}$	40	10	65	0	34
$1\frac{1}{2}$	48	4	77	0	$40\frac{1}{2}$
$1\frac{5}{8}$	56	11	90	10	$47\frac{1}{2}$
$1\frac{3}{4}$	65	12	105	0	$55\frac{1}{8}$
$1\frac{7}{8}$	75	6	120	10	$63\frac{1}{4}$
2	85	14	137	0	72
$2\frac{1}{8}$	96	15	155	0	$81\frac{1}{4}$

In Brunton's cable the matter in the link is thrown very much into one plane; the link being of an oval form, and provided with a stay. As there are emergencies in which the cable must be severed, this is accomplished in those of iron by means of a bolt and sheckle (shackle), at every fathom or two fathoms; so that by striking out this bolt or pin, this cable is parted with more ease than a hempen one can be cut.

The [illegible] will [illegible] the [illegible] view of the Second

Number, that the work still maintains its interest, and promises to preserve throughout the valuable character which we have felt happy to acknowledge.

A Practical Treatise on the Construction of Stoves, and other Horticultural Buildings, and on the Principles of Heat, as applied to Hothouses, Conservatories, and other Horticultural Erections. By J. W. Thompson, Nurseryman, &c., 8vo., with wood engravings. London: Groombridge.

We took occasion last month to give a general view of this work, but on account of the press of matter had not time to get the wood cuts prepared, illustrative of some extracts we proposed to make, and consequently deferred them until the present occasion.

The subjoined account of the works at the Duke of Northumberland's, cannot fail to prove interesting to our practical readers; and those who wish to refer to Mr. Thompson's comparison of the merits of wood and iron roofs, will find it given at p. 24 of the Journal, in a communication to us:—

Notwithstanding, however, that the result of my observations and calculations are unfavourable to iron roofs, I am willing to admit that for lightness and neatness of appearance in the structure, iron has and always will have the advantage; in fact, it would be almost impossible without iron to erect such magnificent conservatories as those of the Duke of Northumberland at Syon House.

Fig. 1.—Elevation of Syon Conservatory.

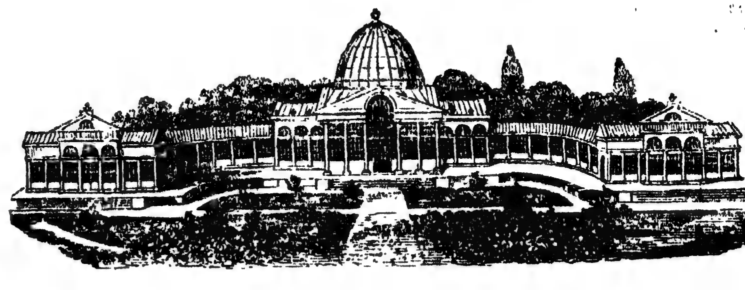


Fig. 2.—Ground Plan of the Conservatory at Syon House, showing the arrangement of the Steam Boilers, Pipes, &c.

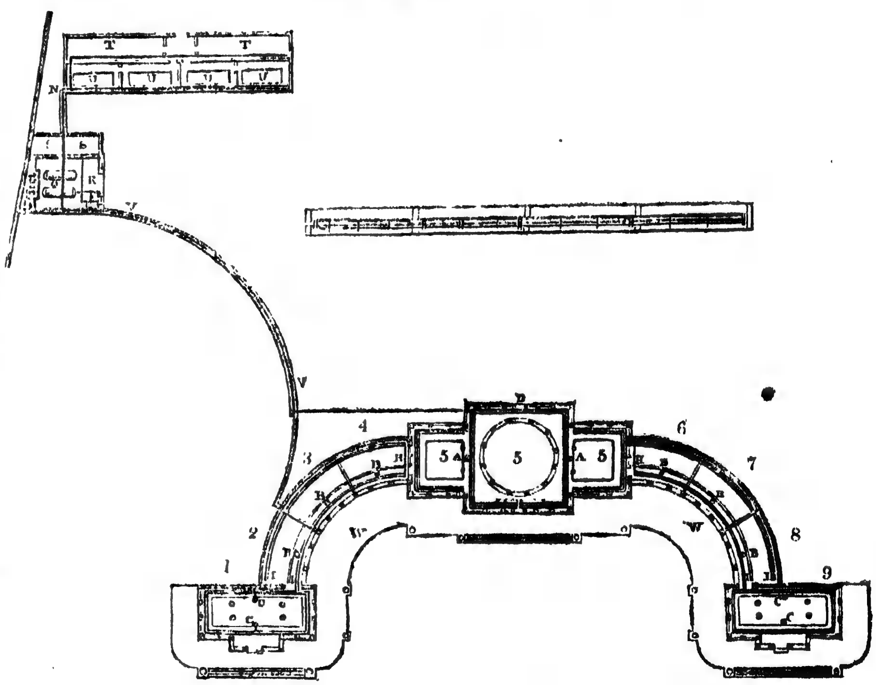


Fig. 1 and 2. Elevation and plan of the conservatory, showing the arrangement of the plant houses, the boiler house, the steam boilers, and pipes for heating the various erections designed and executed by C. Fowler, Esq. The interior arrangement of the houses for the culture of the various genera and species of plants, was planned by his Grace as well as the design for the tasteful flower garden in front of the conservatory, and were executed from his Grace's own drawings. The entire length of the range of houses is nearly 600 feet; the centre represented by a glass dome, see fig. 1., is about 65 feet high, divided as follows:—

1. Camelia house. 2. Geraniums, and other plants of similar habit. 3. New Holland, and other hardwooded species. 4. Delicate stove plants grown in pots, and plunged in bark beds. 5.5.5. Is a stove a hundred feet long for the growth of large trees, such as cocoa nuts, and other lofty fastgrowing tropical plants, which are planted out in beds of properly prepared earth, and some of them are now nearly forty feet high, particularly the Flate palm, presented to his Grace by Lord Tankerville, about six years ago. 6. Delicate stove plants grown in pots, and plunged in bark beds. 7. A choice collection of heaths, and other hardwooded Cape plants. 8. Miscellaneous collection. 9. The Orange house. A.A Vapour valve. for steaming the houses. BB. CC. Similar, but smaller valves, for the same purpose; the centre division has seventeen four-inch cast iron pipes below the paths, all round the four sides of the division. The steam enters from the main at D, and the condensed water passes off at E. The two square divisions adjoining the central one have fourteen four-inch pipes round three sides each. The steam enters at F.F., and the condensed water passes off at G.G. The first curved division on either side of the centre has six pipes each at the front, and six at the back. The steam at the main pipe enters at H.H. The other curved divisions have five pipes in the front and four at the back of each division; the condensed water escapes at I.I.I.I., the end divisions forming the extreme wings of the range, have eight pipes, all round, branching each way from the end of the main at K.K., and deliver the condensed water at L.L. M. Pipe for warming the back sheds. N. Main entering propagating pipes; condensed water passes off at O. P. Chimney divided into four, these to cut the column of smoke. Q. The two steam boilers for heating the houses. R. The boiler house. S. Coal sheds. T. Potting sheds. U. Four propagating or nursing pits. V. The main steam pipe from the boilers enveloped in saw dust, a non-conductor of heat; while passing along a hollow wall into the culvert, and entering the range at the centre or domed house. W. Terrace walk.

At the end of the middle walk of the botanic garden, as shown in the annexed perspective view of the range of houses, is placed a large ornamental basin and fountain, supplied from a pure spring, which rises about a mile and a half from the garden. At the back of the propagating house, as shown in the ground plan, fig. 1., is a row of sheds, the entire length of the propagating edifices, which are heated by a steam pipe, and used for holding plants in pots during the cold winter and spring months.

Mr. Thompson afterwards communicates an interesting account of the elegant conservatory of Lord Ashburton, at the Grange, in Hampshire.

The dimensions of this conservatory are eighty feet in length, forty-six feet wide, and twenty-one feet high, and it was designed and executed by Sir Charles R. Cockerell. The situation of this spacious area is adjoining to the ladies' apartments, the windows of which are directed towards the conservatory. This building is complete both with regard to architectural and horticultural proportions, two important points in similar structures, but seldom attended to, or not with a due regard to the various bearings of situation and circumstances. It is, in my opinion, one of the best buildings of the kind that I have seen either in this country, or on the continent.

Fig. 1.—Elevation of Conservatory at the Grange, Hampshire.

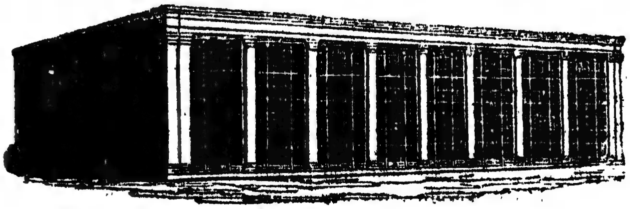


Fig. 2.—Interior View.

Fig. 3.—Section of Conservatory.

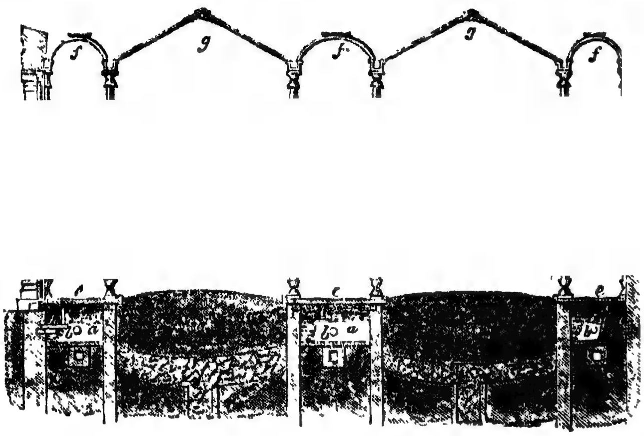
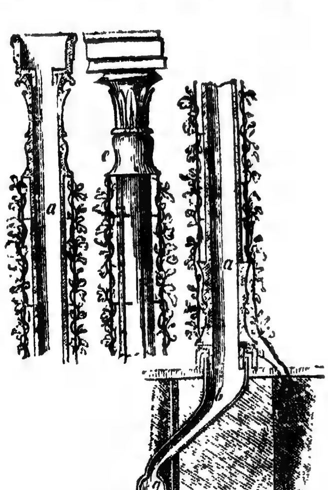


Fig. 4.—Parts of Column at Large.



A glance at the annexed diagram, which represents a section, will at once show how easy it would be, where expense is a secondary consideration, to vary the plan of a greenhouse or conservatory according to the extent of ground, and to have an exotic garden in which perpetual spring could be maintained. The roof, which in this example is double, and which might be continued to any extent, is supported by cast iron hollow columns, *a a*, which also carry off the water that falls on the roof, into drains, properly placed for its reception, as at *g*, and which, after supplying an immense reservoir under ground for the supply of the house, as well as for use in the event of fire, or any other scarcity of water, discharge the remainder beyond the limits of the building. These columns are ornamented with mouldings, and have wires fastened to them, for the purpose of training creeping plants. The side walks *e e*, are four feet nine inches broad, and the centre and principal one *c*, six feet and a half. These walks are covered with an arched roof, formed of double plates of rolled iron *f f f*, between which is left a space of two inches, confining a stratum of air, to prevent the escape of heat, or the admission of cold. Over these plates are placed an iron grating for a safe walk, to enable the operatives to repair the glass, give air, &c. This house was heated by Mr. Sylvester, with steam, the pipes being placed under the walks, as at *b b b*, and the cavity *a a*, served as a reservoir for containing heated air, which was admitted into the house as required.

The two steam boilers were removed, about seven years ago, in consequence of the great quantity of fuel consumed to generate sufficient steam to heat the conservatory, which is now done with hot water.

Iron is indispensable in such extensive erections as those at Sion House and the Grange, Bretton Hall, Yorkshire, the seat of T. W. Beaumont, Esq., or the splendid structures for plants at Alton Towers, the princely residence of the Earl of Shrewsbury, now only eclipsed by Sion: and that now erecting by the Duke of Devonshire at Chatsworth, which, when finished, will surpass every thing of the kind. In such stupendous structures, without the introduction of iron for rafters, columns, and other supporters, the depth and thickness of wood rafters, &c., necessary in such buildings would give them a very dark, gloomy, and heavy appearance; but then much of that evil which I complain of as arising from iron, might be obviated by having the sides of the lights made of wood, and the sash bars of copper, with small rollers affixed to the underside of the lights to make them run easily, but under no pretence should iron be used for forcing houses in pits, nor for small greenhouses or conservatories. I may, indeed, repeat that the use of cast iron for horticultural buildings can only be justified in such extreme cases as in those to which I have alluded. I feel fully confident that if proper attention were paid to the construction of hot houses, and to the materials used in their erection, that the appearance of a wood-roofed house would not be altogether objectionable. For the assistance of persons building houses for horticultural purposes, who may have had less practical experience than myself, I will proceed here to give a brief description of such materials, and modes of construction as I think will combine the whole of the desired objects.

The first thing to be attended to is, to give the roof a proper pitch or inclination, so as effectually to carry off the water and prevent the drip in the house, which is highly injurious to plants grown in pots. Secondly, to form the roof in the following manner: the rafters to be of wood, varying according to the length of the roof from five to eleven inches deep, the section of it to be wedge-shaped from three to four inches in the upper, and about half an inch wide on the under side, the ends and sides of the lights to be made of wood, the top from four to five inches, the sides two inches and a quarter, and the bottom from six to seven inches wide. The sash bars to prevent as much as possible the obstruction of the sun's rays should be of copper, which will give the house a light and neat appearance, and yet not subject the plants to the injurious extremes of temperature, as the small quantity of metal in the thin sash bars, which need not be more than half an inch wide and about the same depth, will cause but very little variation in the temperature by radiation, and suffer little from expansion and contraction. Neither would it increase the expense of the light in any great degree over one made of wood; for as copper of those dimensions would not weigh more than six or eight ounces to the lineal or running foot, I should suppose it could be bought for about 1s. 6d. per lb., the expense, therefore, would be trifling when compared with the advantages; indeed, the extra expense would be repaid in a few years by the saving of wood in repairing the lights, as glaziers cannot hack out old putty without destroying the sash bars, and this being frequently done, when lights are kept constantly in use, very soon lessens the substance.

I therefore recommend all persons when erecting forcing and other houses to have them constructed of the above materials, particularly if they are desirous of excelling in the culture of fruits and plants, as by the use of copper sash bars, they obtain all the desired objects—namely, lightness of appearance, and economy of fuel, glass, and labour. I should further suggest that every gentleman before erecting, or deciding on any particular plan or dimensions for a house or houses for horticultural purposes, should consult his own gardener, or some other practical man acquainted with the subject, as it is impossible for any architect or surveyor, unless directed by, and in conjunction with, the experienced gardener, to know the proper dimensions and elevations of a hot house to answer all the purposes to which it is appropriated so well as the gardener.

We again take the opportunity of expressing our satisfaction with Mr. Thompson's work, and of recommending it to the notice of our readers.

The History and Description of the London and Birmingham Railway. Part III. By Thomas Roscoe, assisted in the Historical Information by Peter Lecount, Esq., F.R.A.S. (Civil Engineer). London: Charles Tilt. Birmingham: Wrightson and Webb.

The third part of this interesting work contains three beautiful engravings—one, the entrance to the railway at Birmingham; the second, a view of the Sherborne Viaduct; and the third, a view of Harrow-on-the-Hill. The letter-press proceeds with a description of the works from the Harrow Station to the Linslade Tunnel, interspersed with an historial account of the towns and villages on each side of the line. The works near Watford show the vast extent of the cuttings and embankments, also the difficulties that are encountered in the formation of railway.

Here the first appearance of the chalk formation is seen, and being mixed with flint and gravel was found highly advantageous in forming the road. This soil was conveyed to and partly formed the embankment which passes by the town of Watford, and carries the railway across the Colne valley. It took nearly one million cubic yards of earth to make this embankment, which is in some places above forty feet in height, and is the largest throughout the whole line. Soon after entering upon it the railway goes over the London road, by a brick viaduct of five arches, of forty-three feet span each; they are composed of ellipses, having voussoirs at the intrados; the centre arch is of an oblique form, in order that the course of the road should be preserved as heretofore. This may be thought a bad feature in a design of this kind, but it was unavoidable, the trustees having compulsory clauses in the Act of Parliament to compel the Company to adopt this form of arch. The manner in which the engineer has overcome the defect in the design is admirable, and it is scarcely perceptible to the observer: it is a very massive structure, and cost in its erection £9,700. The other arches are square with the line of railway; and at either end are retaining walls built into the embankment, making the total length of the viaduct three hundred and seventy feet.

The next bridge conveys the railway over the river Colne. It consists of five semicircular brick arches, of thirty feet span each, with side walls, and having a stone cornice its whole length, the total length of the parapet walls being 312 feet. It has a light appearance; and viewed from the meadows appears very lofty, being fifty feet high. The construction of this bridge was a work of considerable skill and labour, the foundations being of the loosest material possible; in fact, it may almost be called a floating bridge—for it rests entirely on platforms of wood, having sheet piling to protect them. The cost of its construction was little less than £10,000. The whole of the land near this spot is most precarious in stability; and the effects are clearly visible in the amazing "slips" which have taken place in the embankment across the valley. Oftentimes, in a very few hours, the level of the newly formed ground has sunk several feet, while the base of the embankment has widened out to an enormous extent, causing infinite labour to bring the level of the railway back again to its original state, and to make it solid enough for the passage of the trains, this has caused many a sleepless night to the workmen and engineers. The length of this embankment is about a mile and a half, and is composed entirely of the finest materials for such a purpose—chalk and gravel.

Near the station at Box Moor there are some bridges well worthy the notice and study of the engineer.

Within a few yards of the Station, the Railway crosses by a bridge of one arch over the London road, at an angle of thirty two degrees. This bridge will amply repay the engineer, or man of science, for the trouble of a personal inspection; and we will endeavour to describe it to such of our readers as are unable to visit it.

The science of bridge building has, of late years, made rapid strides towards perfection, and there are many instances where arches of immense span have been erected; but we believe no example exists of such an oblique arch executed in brick work as that now under notice. The square span across the road is twenty one feet; but the obliquity causes the span on the face of the arch to be lengthened to more than thirty nine feet: its facial form is that of a flat segment of a circle; and the acute angle of the quoins is chamfered off until it reaches the obtuse angle, where it vanishes. This gives the bridge the appearance of having one voussoir more than it really has; and also obviates the defects which generally attend the construction of skew bridges, by the acute angles of the quoins being broken off or injured, either by settlement or accidental blows. The idea of cutting off the acute angles of such arches emanated, we believe, from Mr. George Buck, the resident engineer of the line from London to Tring. The perfect manner in which the whole of the stone work, and the spiral courses of the bricks, are executed, reflects great credit upon the builders, Messrs. Cubitt, of London.

Holebrook's Patent Propelling Machinery.

A pamphlet detailing the specification of this patent has been sent to us. The first method is a mere imitation and evident piracy of the principle of Morgan's wheel, and decidedly a worse combination; the second is a mode of shrouding the paddles of a wheel, the floats of which radiate from the centre. However valuable a good method of shrouding the paddle wheel may be, that pointed out by the patentee is decidedly the worst that could be devised. The screws and cogs of the pinions and wheels would be torn to atoms, on account of the corrosion by the sea water, if it were attempted to adjust the floats as proposed, after the wheel had been exposed 24 hours to its action.

Designs for Sepulchral Monuments. By Carl Tottie. London: Rumsey, 1838. With Plates, engraved by E. Ravenscroft (Parts 1 and 2).

These designs are, we believe, by a German architect, and represent monuments erected by him here and abroad. They do great credit to his taste, and are characterised by a chaste simplicity and elegance, appropriate to the subject proposed. The first and second, however, one Greek and the other Gothic, have rather a German scantiness: but the third is exceedingly elegant, although we a[illegible] tion the strict Hellenism of the urn. It is appropriately devoted to a young lady.

In the second part, the designs are generally of greater purity; but the application of them seems to us to be rather inappropriate. We should have felt disposed to have devoted the graver to the elderly lady, and the more ornamented to the literary gentleman. The fourth and sixth are pyramidal, which, although we consider rather of an Egyptian than of a Greek character, still are simple and elegant, without that vacancy which we characterised in the previous number. The proportions of the fifth design are almost perfect, except perhaps too great breadth in the base; but the urn and its twining foliage are unexceptionable.

We feel happy to welcome these productions, as they are calculated to do good at a time when, by the extension of cemeteries, a demand has been created for this class of external sepulchral monuments. The cemetery at Kensal Green, and that at Highgate, are fine ornaments to the metropolis, and we find that in the former a considerable demand has been created for a more elevated class of memorials of the dead. Many of the designs there are from the British Museum; but we cannot say that we equally admire the log or coffin-shaped tombs that are spread about in such abundance. Medicine seems to have erected her standard there; and the temple of Hygeia to St. John Long, and a large family tomb to puff a living hygeist, form two of the most remarkable features there.

Architektonische Mittheilungen, Von C. T. Ottmer; *Braunschweig*, C. W. Ramdohr, 1838 (*Architectural Communications* of C. T. Ottmer, Ducal Architect, Brunswick).

This work excites considerable attention in Germany, and induces us to make some remarks upon it. The author is C. T. Ottmer, who has obtained considerable reputation in Germany by his success in building the new palace at Brunswick. The work contains copperplates with letter-press, describing the new theatre at Wolfenbuttle, and giving designs for country houses.

Herr Ottmer has recently completed under the direction of the Duke of Brunswick, a theatre in the Gothic style, in the palace at Wolfenbuttle, and it is principally to the description of this, that his volume is devoted. This edifice is considered in Germany as almost the commencement of a new era, for with their rage for the classic, they had little contemplated the restoration of the Gothic, and least of all its adaptation to the temples of the muses. We believe this is the only instance of a theatre in Europe in the Gothic style, but at any rate it is the most important, and it will naturally be regarded by many of our architectural readers with considerable interest.

The architect has so far felt himself successful in the execution of his task, that, in the height of his zeal for the promotion of his newly adopted style, he adds to his work plans for country houses and residences in Gothic.

On the Construction of Walls. By S. Romberg. Vienna, 1838. (German.) 4to., with Plates.

The preceding work is a fair criterion of the attention shown by the Austrian architects to diffuse professional information. When the general low ebb of knowledge in Austria is considered, it reflects considerable credit that they should exhibit such proficiency in this art. The interest attached to the acquisition of the best foreign intelligence, by both architects and engineers, is fully shown in the architectural periodicals of Vienna, which borrow, not unfrequently, from our Journal and other English works.

M. Romberg's work is exceedingly well got up, and he has availed himself fully of the latest French and English materials. The whole is accompanied by a number of engravings, illustrative of the text.

LITERARY NOTICES.

The second part of the new edition of "Treadgold's work on the Steam Engine" (completing the work) is just published; the plates are beautifully engraved, particularly those of Stephenson's patent locomotive engines; they alone are worth the whole amount that is charged for the work. We shall not fail to notice this work in our next number.

The first part of a "Practical Treatise on the art of Bridge Building," a work much wanted, will be published by the end of the month, it will contain the drawings of several bridges erected by Rennie and other eminent engineers. The work is edited by Mr. Cresy and Mr. M'Neil, both names well known to the profession.

Mr. Foulston's work containing numerous drawings of the public buildings, erected by him in the west of England, will be published in course of the month.

ORIGINAL PAPERS, COMMUNICATIONS, &c.

ON CIVIL ENGINEERING EDUCATION, AND REWARDS.

There is nothing gives us so much pleasure as to find professional subjects the topics of public discussion, for however ignorantly they may be treated, the profession will still gain by any attention which is afforded to them. We are induced to take up the subject in consequence of a somewhat long article in the *Times*, entitled, "Civil Engineering Schools, and State of Things in England." The drift of this article is the favourite echo of the sentimental journey—they do these things better in France; and the writer, having the subject all his own way, has had no difficulty in coming to the wished-for conclusion. Now, whatever opinions we may entertain of Civil Engineering *per se*, and however much we might desire its amendment, we are prepared to maintain its relative merit; and we feel ourselves the more called upon to do it, as this lucubration gave rise to others of similar tendency in the *Athenæum* and other journals.

As it did not occur to the writer in the *Times* to look to reasons, but as he rather prefers to state matters as they appeared to him, we shall, before entering into an examination of the subject, briefly consider the statements put forth. He asserts, first of all, that in England it is boldly said that boys must be sent, if sent at all, to get their scientific education before they are fifteen years of age, because they must go into engineers' offices very shortly after. Now we must beg to inform him, that either he or his pseudo antagonists must be strangely ignorant of the subject which they are discussing, if they are not aware that in no College, where there is a class for Civil Engineering, is any one allowed to matriculate under fourteen or fifteen years of age, unless he had contemplated the enlightened Universities of Oxford and Cambridge, where, however, we believe there have been no boy bachelors since Wolsey. Having set out with this false postulate, it is no difficulty for our worthy critic to knock down the giants he himself had created; and then showing that sixteen years is the age required for entry in France, he proceeds to argue upon the absurdity of English parents and engineers requiring impossibilities, and thinking that mere children can be taught what is hard work for young men.

From this the writer gives a very minute and detailed account of all the various items of preliminary examination; but with all his care he has omitted one indispensable point, to which we beg permission to call the attention of a gentleman so critical, for it is doubtless a necessary qualification of an engineer in the eyes of our Gallic neighbours. Next he describes the severe extent of seven hours daily study during ten months of the year, before which the labours of the idle English clerk are to be considered as nought. Without giving any statement of the subjects of study, he concludes, in a style of much flippancy, by eulogising the French, and reprobating the folly of the poor English.

To have placed the subject fully before the public, it would have been well to have afforded some information as to what has been done in other places, so as to have enabled us to form a judgment upon the propriety of the course proposed to be pursued here. But the writer was probably one of that not uncommon class of English cognoscenti, who, after measuring the continent from Boulogne, and ascertaining the state of society at a provincial table *d'hôte*, are enabled dictatorially to assert the superiority of every thing that is foreign, and the insignificance of all that is English, although their ignorance upon both sides may be pretty much upon a par. He might have informed us, that the Polytechnic School is not a mere school of engineering, but educates students for the artillery, marines, army and navy, military engineering, manufactories of gunpowder and saltpetre, and for all the public situations which require an extensive knowledge of the physical and mathematical sciences. As to the preliminary examination, we will guarantee to find plenty of English boys of sixteen who will go through it with ease, however arduous it may appear in France. The subjects of study are analysis, mechanics, geodesy and topography, statistics, physics, chemistry and manipulations, architecture, French composition, and German and English. No, it would not have suited the critic to supply these facts, for he must have added to them, *proh pudor*, that this complete and unique education lasts two years—a goodly railway speed for manufacturing French civil engineers.

As we are desirous, in some degree, to supply the defect, we shall shortly describe other similar institutions. The Gewerb Institute, at Berlin, is more strictly limited to arts and manufactures; and the studies, which include those of the Polytechnic School, also embrace practical and theoretical instruction in the manufacture of machinery. At Geneva is a school principally devoted to the staple mechanical trades of the city, in which there is a good practical course of three years' study. At Stockholm also is a Technological School.

All this in the eyes of the penny-wise superficial philosophers shows the immense pre-eminence of continental nations, and our glaring inferiority. To the thinking, however, it offers an inducement to investigate the results of these different systems of management. The quantum of education is not always proportionate to the number of schools, nor is instruction solely dependent on public establishments. We should be in a low state, indeed, if our knowledge were to be measured by the system of the two great universities, where no public lectures are given, and nothing is taught but Latin and Greek. What a contrast this forms with a French or German University, or even with one in Scotland, and yet, strange to say, were lectures to be delivered at Oxford or Cambridge to-morrow, none would attend them. The English students do not turn out worse proficients than their foreign neighbours, for although they attend no public lectures, they conduct their education in another way, obtaining that by private study in books, which foreigners receive by the oral instruction of their professors. Here the enigma is solved, and we need not inquire as to who is likely to acquire the soundest information, and have the best organized mind; the one who labours for himself, or he who depends on the studies of another. Were we to compare the subjects of foreign studies with those of an English youth, we could not fail to be struck by the extent of the former and relative paucity of the latter; but the results are far different from those which are at first sight necessarily consequent on such a diversity. There is such a thing as exercising the memory at the expense of the judgment, and it is the difference between these two terms which constitutes the distinction between a foreigner and an Englishman. Whoever has witnessed the encyclopædic examination of a German or French college must have appreciated this, and seen how the student sinks when separated from the corks, which may bear him well so long as he has them at hand, but without which he cannot meet an emergency. This is particularly the case with German education, which of all others asserts the highest claim in the eyes of its votaries to be considered as a system particularly calculated to develope the mind. It is true that they furnish the mind with abundance of materials upon which to operate, but they never afford it means to exert its powers; and the system pursued may be as well expected to augment the reasoning powers, as to weigh down an infant with a heavy musket would be calculated to prepare him as a soldier. This cultivation of the judgment is the essential distinction of English education, and however faulty it may appear to some, it will be found, on investigation, that it has not rendered us worse than our neighbours, while, on the contrary, it has enabled us in most cases to be their equals, and in many instances to be their superiors.

If genius were to be taught in universities, and if science were only to be gained from the dictates of professors, we should indeed be in a miserable state of mental degradation. What, however, is our relative position? Our poetry is not only equal to that of any other nation, but we have produced the only epic poet in the sublime. Our drama has overturned the French school, and is paramount in Europe; and our literature has either been the parent of that of new nations, or supplanted the literature already existing. In the fine arts, however far we may be behind the ancients, we are certainly on a par with the moderns; while we have schools of architecture and painting which may lay claim to a superiority over those of the Continent, in the departments of copper-plate and wood engraving we are confessedly supreme. In every thing we have gone beyond the rude lessons of our masters, and there is no branch of science to which we have not contributed more than our quota; in metaphysics, in philosophy, in mathematics, in astronomy, chemistry, and geology, we can justly claim a considerable share in their progress, and in many instances we have wrought out the pure metal where we had received only the raw ore, or the refuse dross. Talk not of going to France or the Continent for instruction, but rather search through western Europe for the monuments of our mental power; from the constitution of the state, down to the very fuel on the hearth, how few things are there which have not an English origin?

Having thus considered how far national constitution must necessarily operate in causing a modification in the process of instruction, and how far the course pursued in England has contributed to the satisfaction of the objects required, let us now examine how far we shall be justified, in the particular case of civil engineering, in remodelling our present course, by the example of our French neighbours. To whatever department we direct our search it will not be very easy to find any symptoms of inferiority in the working of our present system. The French roads, independently of their wretched construction, have been for years rendered worse for want of repairs, and they are so deficient in extent that the mere outlay necessary is so considerable as to render any attempt at improvement an object of financial terror. We have not the Alps in England, but it would not

be difficult to find a parallel for the roads over Mount Cenis, and the Simplon. Canals are so rare, that commerce derives scarcely any benefit from them; and as to their engineering merits, we believe they are bounded to their being the only works of the kind in France. We are not aware that the French docks and basins are of more excellence than our's in the detail of their construction, but we know well that they are neither equal in number, extent, grandeur, or genius. The principal work as a harbour is Cherbourg, and that may look up, on the opposite coast and find many rivals. As to bridges we will willingly pit the bridges of London against those of all France, and we are not afraid of the contest when the French engineers have yet to equal the Roman remains in their own country. There are more bogs drained in Ireland than there have been in all France, and they have no embankments of land which it is necessary to put in rivalry with those of the Wash. It would be hard, perhaps, to put railways into the scale, were not the assumptions of superiority such as to render it necessary to ask what instruction we are to derive from France in that department? Why, we can tell those who think so lowly of their country, that what we have to be taught is, that the French are learning from us.

The Normal school may supply France with very excellent engineers, chemists, manufacturers, and mechanists; but we must beg leave respectfully to doubt whether this admirable system is calculated for either English or Americans, or whether we should be justified in rejecting one by which we have already gained a superiority. It is a pity, if our foreign friends do really possess such pre-eminence, that they do not come over here, for they know well that the English people are ever ready munificently to reward merit, and that they have never been swayed by any local prejudices to withhold their patronage from any one of any nation. They have not hitherto done this, and the only foreigners who have come among us have, under the highest auspices, only failed in quackery and nonsense, in cases where Englishmen had already succeeded. No, no; there is no occasion to come to England to teach us this lesson; let them go and look at the Stephenson locomotive on the St. Cloud railway, at our engines navigating their waters, and at their mines and factories, conducted by Englishmen under the shade of their high scientific attainments.

> Tityre, tu patulæ recubans sub tegmine fagi
> Sylvestrem tenui musam meditaris avenâ:
> Nos patriæ fines, et dulcia linquimus arva.

The English mechanic has no Encyclopedia of Trades to consult, no Ecole Royale to frequent, and no Conservatoire des Arts et Metiers, in which to exhibit his performances; but he can study in his own house, has his own periodicals, can learn from his brother workmen, and frequent a Mechanics' Institute in every town, while he has the free-born spirit of the English race to direct him, and the statue of Watt to remind him how his fellow-countrymen can appreciate his labours.

In repudiating the absurd assumptions of foreigners, and vindicating the merits of our own countrymen, we are far from wishing it to be understood that we are opposed to the introduction of any improvement, or wish that the profession should remain stationary. On the contrary, none can be more fully persuaded that the great source of our superiority lies in the readiness to adopt whatever is new and useful, and in carefully discarding whatever is antiquated or absurd; we cannot, however, coincide in thinking that the French university system is in the least degree suitable to the habits or exigencies of our own nation, or our brethren in the United States. We are fully disposed to hail with approbation the course proposed by the English colleges, and we think that the practice of the students attending philosophical lectures will prove an important help to their professional education, while, on the other hand, we should absolutely deprecate the idea of any attempt totally to educate them, whether in an English academy or the Ecole Polytechnique itself, which might perhaps turn out a very good surveyor's hack, but would not be very likely to produce a Smeaton, a Brindley, or a Watt.

Among other improvements which we should earnestly desire to see effected, would be a more equal distribution of loaves and fishes, as we see no reason why civil engineers should be the only unrewarded class of her Majesty's intellectual subjects. It is not that we think that yards of riband are absolutely essential to the prosperity of the profession, but because we feel that in the universal shower, mitres might be found to fit other heads than those to which they have hitherto been restricted. After the foreigner has ended his special tour to our great engineering monuments, which are the great attraction to continental visitants, he need not take very much trouble to ascertain the quantum of gratitude and honour which has fallen to the lot of the praiseworthy engineers. He may, perhaps, from the contemplation of other professions, have had his expectations raised, and he might very justly anticipate that at least something would be done for the well-deserving of their country. No *a priori* comparative calculation will, however, enable him to form anything like an estimate, for without speaking of the legal profession, he will find eight or nine artist knights—painters, sculptors, and architects; and as many baronets and a score of knights among the physicians and surgeons, besides G.C.H. and scientific honours superfluous. The architects build in brick, and therefore they are not neglected; but the engineer, because he works in earth, is to get nothing for his labour. The only knight was made so, more for a bridge, more as an architect, than an engineer. Captain Brown got his foreign cross of Hanover, partly because he had a naval title; and with the crosses of Leopold, held by the two Stephensons, ends the muster-roll of professional honours. We may perhaps consider as a dawning of a better system, that the President of the Institution of Civil Engineers has been appointed a member of the Council of the Metropolitan University; but we should desire that, if the golden shower is to be scattered, that it may come before those who have deserved it have passed from this life, or attained a period when they no longer care even for the fame of their own labours.

This neglect is certainly not of to-day, but it is one to which it is high time that a remedy should be applied. Labouring against obstacles to which no other profession is subjected, we certainly cannot think that their hard-earned pecuniary gains are anything more than a compensation for the abuse of the vulgar mob, or the bear-baiting of Parliamentary counsel; and although an Englishman's spirit will make him do his work without reward, we do not think that the dignity of the nation allows the obligations solely to lie on one side. While the living are without honour, the dead are without remembrance, and the neglect which obscures the present engineer has forgotten to commemorate his predecessor, for with the single exception of Watt, who has obtained statues more as a mechanist and a Scotchman, there is not one person connected with the profession of whom an artist has made a record, or that has a marble sculptured with his name. That the profession has not been wanting in men deserving, we appeal to Brindley and to Smeaton, who from the glories of their works may despise all other monuments, and call on their admirers to look around.

ON DESIGN.

"It is very possible that men may lose rather than gain by these; may lessen the force of their own genius by forming it upon that of others; may have less knowledge of their own, for contenting themselves with that of those before them."—ESSAY ON THE ANCIENTS AND MODERNS, by Sir W. Temple.

The little originality which is observable in the architectural constructions of the present day would almost induce one to suppose that the talent of design existed only among the ancients, and that the moderns are mere imitators. There appears to me to be too much attention paid in this age to classical models. What are our buildings in general but ill-adapted semblances of antique beauty? In what consists their originality? The Pyramids of Egypt we admire for their grandeur, the Parthenon for its elegant simplicity, and St. Peter's at Rome for its unaffected sublimity; even the Gothic cathedrals of our forefathers, confused as they appear in construction, and as diversified in ornament, delight us in their magnificence, and excite our admiration at the bold originality of their conception. There is nothing of this primitive character observable in modern buildings: a portico, minutely copied from the antique, or an Italian façade, engrosses our highest efforts in the art. Beyond these exertions of our imitative faculties we seldom rise. Our architecture, like our literature at an earlier period of our history, abounds with Latin translations and Greek roots. We slavishly adhere to the instructions of the ancients, and too frequently differ from them only to show the poverty of our intellect and the barrenness of our imaginations. It is true that by a well-directed study of classic models we may derive considerable benefit; our ideas may be enlarged and taste refined: the ignorant alone disregard knowledge which they cannot comprehend; the self-sufficient despise the efforts of their predecessors. But conceding thus much to the ancients, I must think that we err in following them too closely. Should we not rather, receiving their suggestions and duly respecting their instructions, strike out for ourselves new and better-adapted designs? At what eminence can we arrive by mere imitation? It may suit the torpidity of our inactive genius, but what glory can it achieve for us in the eyes of posterity?

If indeed we are incapable of conceiving designs ourselves, or rising over the genius of the ancients, it were well for us rather to adhere to their models than to erect our own. So far as those may guide us, they serve as standards of taste, but no farther. Too close

an attention to their beauties begets a lassitude of intellect; we admire them as Telemaque would have admired Calypso, forgetful of his own glory; we dwell upon their beauties with a slavish admiration, which weakens the power of our minds and subjugates our capacities to their tyrannous authority.

This is the age of trifling; instead of those manly and vigorous efforts of a refined natural genius, we see little but the puny exertions of a meagre and acquired taste. Architects, with few exceptions, seem fearful of putting forward the abilities with which Heaven has endowed them; sheltering their talents under the power of ancient and approved rules, they incautiously become mere copyists—"imitatores servorum pecus," and enslave their minds to the domination of antiquity.

By the study of ancient models we observe much that may reasonably be adapted to present uses. The proportion of their columns is admitted to be just and symmetrical; their mouldings in general are appropriate and elegant, their ornaments beautiful and suitable to their purpose, and the *tout en semble* of many of their buildings, as the Temple of the Ilissus, the Parthenon, and the Pantheon, fills us with admiration at the inventive genius of the noble-minded people who possessed the desire and ability to erect monuments so grand and celebrated. On the other hand, the style of their buildings cannot be wholly consistent with our country; the difference in climate, in habits, and in situation, necessarily calls for an alteration in design: what was appropriate as a mode in Greece might be ridiculous in Italy, and must be somewhat *outré* in England. The more I reflect upon our local and moral distinctions, and upon our present plagiarisms in architecture, the more I deprecate the system and lament our want of originality of thought.

Let me hope that these observations may meet the eye of those who have the genius and power of thinking and acting for themselves. Shaking from their brains "the dust of the schools," let them dare to be original in design: the ancients let them regard with the admiration due to their genius and the respect due to their authority, but not with the humility of a slave or the submission of a child.

While I behold so splendid an effort of thought as Barry's design for the new houses of Parliament, I cannot think that we want inventive genius, but must attribute its non-appearance to inactivity of mind. Architects, in the present day, "swarm like locusts on the banks of Nile," or architects in name; but how few of these undistinguished column rearers are worthy of the honours attached to the profession. To these I do not address myself, but to such only as are architects in character; them I would instigate to arouse themselves from the apathy of imitation; them, upon whose exertions much of the glory of our country depends: and if these remarks shall only excite among them the desire of originality, I shall not have written in vain. H. G.

COMPETITION DESIGNS.

"The better please, the worse displease; I aske no more."—Spencer.

We have endeavoured, in a few preceding papers, to place before our readers opinions on various architectural compositions, and the train of reasoning upon which those opinions have been formed. The criticism being under an assumed initial, our observations will be taken only for what they are worth; no great name consecrates an abuse, no insignificant one detracts from a just observation; valued only by their propriety, they can be appreciated only as they embody a true perception of the subject. Anonymous criticism on the fine arts seems, indeed, and especially in referring to very modern works, extremely desirable; for as there is no appointed judge in these matters, no Attorney-General to apply to, no Lord Chancellor to confirm a decision, a general feeling only can direct the public mind.

Even thus sheltered, it is not possible to escape personality; and although endeavouring to frame our remarks with the most scrupulous fairness, and in no case offering an opinion without citing our reasons or our authority, we have some who will cry, with the Israelites in the desert, "Who made you a judge over us?" The latter character we utterly repudiate. We are, as far as in us lies, advocates for what we think true principles, and opposers of those who violate them.

Nor are we, while condemning these violations of established rules and ancient examples, at all aware that we are therefore to be considered as upholding a system of servile imitation; nor can such a charge be borne out by any observation we have yet made. When, to avoid servile imitation, an artist starts into an absurdity,—when that his building may NOT look like a Greek one (a most desirable attempt), he deviates into increased expense and positive deformity, we would fairly ask the judgment of the few who have studied the art, and of the many who are ignorant of it, whether such deviations can be desirable.

Indeed, we find a difficulty in defining servile imitation. No medical practitioner exhibits a new medicine merely to avoid the repetition of what is established as good; no divine starts a new doctrine instead of the old and true one, merely to avoid what is old and true. If a public body has decided upon a large building, and determined to confide to their architect the erection of such a monument, giving him a parallelogram, and only requiring that it have a noble portico at one end, we can conceive no possible reason for any deviation from the form of an antique temple.

If the ground were *not* of such a form, if it were hemmed in by adjoining houses, if the purposes for which it were to be applied necessarily divided the building into several floors, then would the endeavour to make such a building a copy of an antique temple be an absurdity, and the attempt a failure. But even here the servile imitation should not be forgotten. It may be that some covering should protect the entrance, and that for that purpose a portico should be applied to it; where, even in that small portion of the building, can *better* than Greek proportions be applied to the columns, to the entablature, to the intercolumniations? To avoid such servile imitation is again to dash into extravagant heaviness or meagre weakness. To parody an observation of the late Brinsley Sheridan, who is reported, speaking of London, to have said, that "assuredly it was the best place to live in for nine months of the year, and he did not know a better for the other three;" so we say, that nine times out of twelve the Greek proportion is the best, and we don't know a better for the other three.

The judgment to make the true application of this principle, and to bring to the service of modern architecture the established rules of the great masters of the art, may certainly be acquired without an apprenticeship to the craft, nor can such a test ever be applied to its professors. Under it Michael Angelo, the author of the dome of St. Peter's at Rome, Perrault, the designer of the facade of the Louvre at Paris, Sir Christopher Wren himself, and indeed many professors who are at present practising with the greatest success, would not be found upon the roll.

Our business is, however, rather with the unprofessional than the professional, and with the right to judge of architecture which every one assumes, much in the style of the old distich, of which we do not just now recollect either the author or the occasion.

> I do not like thee, Dr. Fell,
> The reason why I cannot tell;
> But this I *do* know very well,
> I do not like thee, Dr. Fell.

This doggrel embodies the whole principle of criticism usually applied by unprofessional persons to architecture; while upon the arts of painting and sculpture no such general observations are made. The picture intended to represent a given subject, either conveys the story or not, either exhibits in natural and characteristic attitudes and expression the sentiments of the scene, or, if it fails therein, the spectator can easily detect the cause of that failure. He remarks that the passion is exaggerated, that the principal action of the scene is not sufficiently prominent, or, descending to minutiæ, he can observe that the proportions of the figures are incorrect, that the heads or the extremities are too large or too small; and he is enabled thus particularly to criticise the work before him, not from any education as applied to the arts of painting or sculpture, but simply from the contemplation of those natural objects that always surround him. The unprofessional critic upon architecture, having no such natural guide, blames or praises without knowing why; and, in the same breath with which he deals out his dislike or his admiration, acknowledges his ignorance of any principle by which his decisions are guided.

But we think that one, and a very essential object of the Architect's Journal, should be to afford some certain data by which not the professors (for they are supposed to have studied it), but men educated to the highest classical and mathematical learning in our universities, should be enabled to discriminate between right and wrong, as concerns the exterior of architecture, its application to its several uses, and the proportions which time has sanctioned. It is surely not enough that they should say "I like it, but I don't know why;" they should see a reason for their likes and their dislikes. By such means incongruities would be avoided, and buildings upon which thousands of the public money have been expended would not remain for ages a mockery and a disgrace to the times in which they were erected. The ordinary course of a series of lectures upon architecture of the present day is the arrangement of dates, a history of the progress of the science, from the hut of the savage to the temple of the gods. But it is surely scarcely worth while to settle with the accuracy of a lawyer, when wood gave way to stone, or thatch to slates, when the pointed arch superseded the round one, or the Greek proportions obtained over the Roman; the point to be settled is, *what is the most beautiful, and in what that beauty consists?*

And now that the profession seems likely to be ever placed under that incubus, competition, which, however, in the case of the houses of Parliament, it in a great measure sought, and which, from the experience of its baneful effects, we most sincerely wish the government had resisted, by asserting their right to the appointment, it will be the more necessary that the public should receive some knowledge of the leading principles of the art. Our objections to the system of competition, which has lately grown up, are—*its frequent injustice to individuals—the utter hopelessness of a competent tribunal* (as regards extensive and complicated buildings)—*its apparent fairness, but masked duplicity.*

In the first instance, by its operation the steady labours and useful attention to the business of public bodies, frequently during a long period, of upholding crazy and antique buildings, is set aside on the plea, that as so large a sum is to be expended, it is right to try, by a general competition, to obtain the best designs. In the next place, as in the case recorded in the last number of this journal of the building at Rugby, is it not lamentable to learn that more than sixty persons should have been induced to give their time to the bare chance of so moderate a remuneration, and submit the decision of the merits of the design to the judgment of a country attorney. Now Mr. Wrat-is-law may be a very good authority for What-is-law, but that very proficiency is the guarantee of his ignorance of another equally difficult science, and he takes or rejects without knowing why or wherefore—an unlearned, if an impartial judge. In the third instance, an opposition (and such will always exist in some quarter) is made to intrusting the new work to their own long employed architect, and in order to carry that opposition into effect the liberal cry of a competition is started. It is impossible to resist it. The party who has probably been engaged for months in endeavouring to please all parties by making his designs square to all opinions, and who thought the business on the eve of commencement, is requested to attend the board. The chairman then informs him that the board are highly satisfied with his zeal and attention to their business, and with the promptitude with which he has forwarded their wishes with regard to the new buildings; they have, however, a *public duty* to perform, and, as a large outlay is to be made, they have thought that the most satisfactory mode would be by public competition. They have little doubt but that the talent he has always shown will on this occasion be successfully exerted. The architect conceals his disappointment under the show of great respect, and retires. The board breaks up. In the lobby he meets the chairman, who takes him into a corner, and says, "My dear fellow, that obstinate fool, Jinks, who has always opposed our building scheme, could only be propitiated by allowing the affair to go to a competition. However, as it has been determined upon, make your designs, and we will take good care that you have it." Now there is a story illustrative of this which we will repeat, because we have heard it from good authority. In a late competition it was *somehow or other known* in the committee that the device of the to-be-favoured one was an anchor. They met, and at the close of the day's sitting, after turning over nearly eighty sets of designs, they found a second anchor. What was to be done? THE Anchor was the object, and that object was to be sought. Accordingly the committee adjourned for a week, got a further clue to their friend's design, and then moored themselves on the right anchor.

In some instances these trials have brought forward talent that it is wonderful the parties were not previously acquainted with. In the case of the Reading drawings, the committee, after seeking by competition the best talent of the whole country, found the designs of a very young man, the son of one of their own directors, superior to all others; and in the Licensed Victuallers' School competition, the design of their own surveyor excelled those of the seventy competitors. This was very satisfactory to the first parties, but it was very unfortunate that the directors could not appreciate such talent without putting so many persons to considerable expense and anxiety, to prove the superior abilities of the party with whom they were so immediately connected.

We therefore condemn general competitions as prejudicial to the quiet working and legitimate rights of the profession, as unsatisfactory in its results, and as (much too frequently) the covering of a concealed fraud.

It will be difficult to persuade the profession generally to acknowledge this opinion, however much the most thinking among them may admit it. We know that the sexagenarin, whose motto is "Dum spiro spero," will not: the experience of forty years has not convinced him that the figure he sees floating above him is the personification of delusion, not of hope. Nor will the bolder professor, whose motto, "Fiat Justitia," would command attention and assumes somewhat of a threat: nor will the youth who takes the motto "Forward." To the two first we have nothing to say, but upon the last we would impress this truth—that he would do himself more good by working out carefully, with all its details, one Roman palace, than by a hundred sets of competition drawings. From their nature he can seek no advice from his seniors, and he is afraid of his equals; for he has always a notion that he has some arrangements that might be filched, and he therefore labours on in the dark from his own inexperienced store. The main plea upon which he is induced thus to exert himself, for which he rises early and goes to bed late, sleeping over his legitimate employers' drawings, that he may be wide awake to his own, is that it is PRACTICE; but it is a practice he had better discontinue, and he will find his account in studies more legitimate, because more congenial to his age. We know no one who will be injured by the abandonment of this bad system, but the picturesque draftsman. Passing from house to house, he daily performs as great a miracle as Joshua, for he makes the sun to shine from every quarter of the heavens, and illuminates the east and the west, the north and the south aspect of his building with the same brilliant light. How many porticos are spread along the eastern and northern fronts of this great city, adding gloom to natural darkness, which, we will venture to assert, when submitted on paper to the persons who were to decide upon their adoption, were glowing with sunshine. Had the parties recollected that, in the eastern front, no such effect could exist after ten o'clock in the day, and that, in the northern, it would at no time be so illuminated, would they not have hesitated so mischievously to expend their funds in perpetuating gloom without shelter, and heaviness without relief.

But seeing the utter impossibility of obtaining a sufficiently informed tribunal, through any but professional assistance, and feeling the extreme difficulty of prevailing upon parties to surrender their judgments in such matters, we fear it can neither be checked nor directed by any thing but a better education and enlightenment to the principles and philosophy of the art. The ignorant cry, "Am I not to be pleased with what I pay for?" should be deprecated and denied; for no one has a right to inflict on posterity his whims, caprices, or tastes, in opposition to the approved opinions of professional education. If he will wear the cap and bells, he is at full liberty to do so in his own person, but he has no right to perpetuate them in marble or stone upon his descendants.

If it be, however, advisable to sanction a so generally suspicious proceeding at all, we should say that the system of nomination as adopted by the committee of the Reform Club was the best. The remuneration to the unsuccessful parties was very inadequate, and we believe was not claimed, but it should have been more equal to their trouble, and the drawings should in that case have become the property of the club, with liberty to engraft on the most approved design any parts of them the committee might think advisable.

Herein is a positive and considerable expense, but there is in return positive and considerable advantage—namely, the satisfaction of knowing that although you have not swept all England, from John-o'-Groat's to the Land's End, for ideas, you have obtained the opinion of the most experienced, and selected from the most eminent of the profession. Our remarks do not, however, bear upon the competitions for the Nelson and Wellington Memorials. We are fully convinced that a committe of noblemen and gentlemen are as equal to determine whether they shall be embodied by a column, an obelisk, a group, or single figure, as any body of artists can be; but we deny the competency of such parties to understand a set of complicated drawings for an extensive building, and the relative bearing of the plans, sections, and elevations, upon each other. They will be guided to their decision by that most imperfect organ of our senses—the eye, and the result will often be an almost utter abandonment of the plan itself, from some impossibility of construction, and of the most leading features of the design that captivated their understanding, from its utter uselessness. And this is one of the most serious objections to which general competition is subject, both as regards the architect and his employers. Careless of pleasing himself, his object is to hit the taste or mystify the judgment of a committee; instead of graceful movements, he substitutes pirouettes that shall astonish, and sacrificing his own studies and feelings to the necessity imposed upon him, shelters himself, as he places his enchantments upon paper, behind the authority of Dryden—

> "He's bound to please, not to write well, and knows
> There is a mode in plays, as well as clothes;"

upon which lines the poet's annotator, Landsdowne, has this remark: "Who writes to live, must unavoidably comply with their taste by whose approbation they subsist; some generous prince or prime minister, like Richelieu, can only find a remedy."

We may probably wait a long time for the happy advent, but when the reign of good sense shall arrive, the architect will be allowed to

embody his own designs, and be no more controlled by his employer, than the physician in the composition of his prescription, or the lawyer in the phraseology or terms of his settlements.

"The better please, the worse displease, I aske no more."

J. H.

REMARKS ON AN ANTI-PYRETIC COMPOUND,

FOR RENDERING TIMBER FOR HOUSES, SHIPS, AS WELL AS FURNITURE, NON-COMBUSTIBLE, OR NOT LIABLE TO TAKE FIRE; AND ALSO FOR PREVENTING THE DRY-ROT AND DECAY.

By John Hancock, M.D.

The following remarks have originated from experiments made long since; but, owing to other engagements, they have hitherto lain neglected.

Considering the immense destruction of property annually caused by fires throughout the British Empire, and their ruinous consequences, especially in so dense a population as this metropolis; considering, too, the immense amount of property and of lives embarked in British shipping, and their liability to those horrible disasters which not unfrequently occur from the consuming element at sea, where no means of escape are afforded to the miserable sufferers, I am induced to hope that the following propositions, founded on many experiments, will, at an early period, meet that attention of the British Government, which the importance of the subject so justly demands.

The object of these experiments, to which I have devoted much time and attention, was to find out a cheap and easy method of rendering wood and other materials incombustible, or not subject to take fire. To this end a great number of different substances were, with varied success, submitted to experimental examination; and after numerous trials, made with all possible care, I have discovered a chemical compound, possessing all the properties so long sought for—seasoned wood, saturated therewith and dried, being found to resist the action of fire far better than greenwood, or that which had been recently and long soaked in water. In fact, it is thus rendered incapable of feeding flame, or of propagating combustion, where a fire has commenced.

The most prominent recommendation of this method is, that it affords not only *security against fire*, but likewise *preserves timber from decay*, or what is called the dry-rot—a decomposition which is supposed chiefly to result from the growth of vegetable fungi. The same process, it is believed, will be found to prevent the depredation of worms in timber; but for this object no adequate trials have been made.

Corrosive sublimate has long since been proposed, and is now employed, as a preservative against the dry rot. It is indeed a powerful agent against the desomposition of vegetable matter. It should not be forgotten, however, that corrosive sublimate is one of the most active of the mineral poisons—not surpassed even by arsenic; and, in a smaller dose, it has been said, will destroy life. We are told, indeed, that Dr. Faraday has asserted that corrosive sublimate emitted no hurtful effluvia. This asseration may unintentionally delude the public, by using a name so justly venerated. It is well known that corrosive sublimate is not a *volatile* poison, and no one could expect its effects to be exerted through any exhalation; but in any dwelling-house, where the timbers and boards have been soaked in its solution, it must be highly dangerous, especially when there happens to be any moisture, percolation, or dripping therefrom, which might be frequently liable to fall into food or drink; and a ship so prepared (with the sublimate) would be still more liable to such accidents, being often exposed to extreme moisture. Besides all this, the expense of corrosive sublimate must, for ordinary purposes, be a material objection to its general use. It seems extraordinary, indeed, that such an extensive use of this poison should be tolerated, when we consider what an outcry and alarm were lately excited by the discovery that a few grains of arsenic were employed in the manufacture of candles.

It appeared desirable, therefore, that a more eligible substance should be sought for; and one that should *preserve timber* not only *from the rot*, but also *from accidents by fire*. This double desideratum, it is presumed, has now been realized.

The expense of materials for the preservation of timber in the manner proposed, to guard against fire and against the dry-rot, is very trifling, as will ben subsequently proved.

It is important to observe that, besides the preparation of the materials *intended for the construction* of ships and buildings, the same preservative may likewise be applied *to those already constructed*, and afford them nearly equal security against accidents by fire. This could readily be effected by throwing the prepared liquid over the floors; while joists, skirtings, casements, and other parts liable to take fire might be prepared by saturating them by the use of sponges dipped in the liquid. It is a fact well known to firemen, that nine times in ten it is either the floor, or the casements adjacent to the chimneys, which first take fire; it is, therefore, of great importance that the wood-work so exposed be prepared with double care, or more effectively imbued with the anti-combustible compound.

It would be absurd to pretend that wood can be rendered incapable of being consumed, when it is a fact well known that iron and other metals are combustible by strong heat. All that is meant here is, that it is rendered, by the present process, uninflammable, and capable in a great degree of resisting the action of fire; so that, where a fire has commenced, it cannot advance, or be propagated on materials subjected to the preparation; and thus all kinds of wood may be made to resist the action of fire, excepting that which greatly abounds with resin, and which occurs in the American pitch pine, though rarely to that degree that it will not imbibe any whatsoever.

Such articles as tapestry, bed-curtains, &c., are, as is well known, very liable to take fire; these may be prepared with the anti-pyretic solution diluted, and will be preserved from the depredation of moths and insects, which are so destructive to furs, to carpetting, and divers kinds of furniture.

The same preparation is not only effectual as a preventive, but also most powerful in *extinguishing* fire. One charge of the engine with this solution will effect as much perhaps as eight or ten with common water; and besides, when thus extinguished, the fire will not rekindle. This is an important point gained, when we consider the devastations which too often occur after the fire is thought to be extinguished. Parkes, in his Chemistry, makes the remark that water, in many cases, accelerates combustion; and we cannot wonder at this, upon reflecting that water is composed of hydrogen and oxygen, the most combustible substances in nature, and producing the most intense heat. Water, by the agency of heat, is decomposed, and thus becomes the fomites or pabulum to flame. Greenwood, it is certain, makes a stronger fire than dry, and coals are sprinkled with water to increase the heat of the forge; and on this principle is founded the recent invention of Mr. Rutty, in the combustion of water with resins, oils, &c. The London firemen are partly acquainted with this fact, and assert that when the fire rekindles it burns with great fury, and is the more difficult to conquer. This was exemplified both in the conflagration of the Houses of Parliament and of the Royal Exchange.

Those who may still consider corrosive sublimate as the most efficient preventive of dry-rot, may add this to the compound. The salts therein dissolved, so far from being incompatible with the sublimate, render the whole more soluble; and the timber thus prepared may perhaps be found still more capable of resisting the decomposition which occurs from the ordinary action of its own elements. Thus we have a preparation even more efficient against the dry-rot than the simple sublimate solution, and at the same time a safeguard against the destructive effects of fire; and it may well be thought surprising that more attention should not have been given to this most important desideratum.

If a further security for laths, posts, beams, &c., be thought desirable, we may give them a coat of stucco or cement, which might afford an additional security against fire. The composition recently tried at the White Conduit House, and at Kennington, is of this sort, which, however, is not more effectual against fire than the ordinary mortar formed with lime, terrace, &c.; and it is not applicable to panels, partition boards and sashes, nor to the pieces about the fire-place, nor upon the floor-boards—parts most exposed and liable to take fire. Every one is aware that mortars and terro cement, like other earthy matters, are non conductors of heat; and, applied in a thick coat, may be used with advantage against fire, in the hidden and coarse wood-work of houses. This method was invented by the late Earl Stanhope (then Lord Mahon), and was published by him in the Philosophical Transactions for 1778.*

It is a well known fact that wood becomes still more inflammable by the turpentine and oil used in paints. An incombustible paint might be also formed. If, however, the wood be duly prepared, it will remain untouched, even should the paint be consumed upon it. Welbeck Street, London, September, 1830.

SUBSTITUTE FOR GRINDSTONES.

Sir,—From the frequent deplorable accidents which occur in manufactories where large grindstones are in use, especially where they are required to revolve with great rapidity, I venture earnestly to recommend to the attention of all those who employ them, the substitution of the grinding vehicle constantly employed in Hindoostan, in the use of which, of whatever size it may be required, no dangerous accident can possibly occur.

This is merely a composition made of shell lac, rendered plastic by heat, with powdered corundum of different degrees of fineness. Of course emery or any other grinding matter may be applied suitable to the purpose.

There are many advantages attending the use of the Indian grindstone, which, besides those which humanity will dictate, are worthy of attention.

If a grinding surface parallel to the axis of rotation is required, a drum of sheet iron, coated with the composition of shell lac and emery, to the depth of half an inch, presents a durable form of grinding apuratus, free from every possibility of accident. Ground glass, or silex, or even the powdered remains of broken and worn out grindstones, may be used instead of emery, for coarse purposes.

If a flat grinding surface, perpendicuar to the axis of rotation, be required, a disk of sheet or cast iron is at once a durable frame for the same.

If curved grinding surfaces are required, I need not mention how easily the frames can be formed of the necessary curves, and the utmost accuracy of turning may be applied to render the grinding surface of emery and lac perfectly true.

The heat of a red hot iron, applied near the surface, sufficiently softens the composition to enable the workmen to renew the cutting surface of the emery, as often as required, and it must be recollected that water has no action whatever upon it.

While upon this subject, I may mention the facility and economy with which polishing brushes of every variety of size and shape may be made, by coating the frames of drums, &c., with shell lac to the depth of half an inch, and then inserting the bristles for the polishing surface in holes made in the cement with fine heated wires.

I sincerely hope that some eminent engineers will introduce this description of grinding apparatus into their workshops, when I have no doubt their advantages will be immediately perceived.

Yours, &c., SAMUEL PARLBY.

* This invention was put to the severest test by that ingenious and talented nobleman, in the following manner:—A fire was kindled with faggots close to the prepared building, and a room filled with combustible materials was fired; the flames rose to the height of more than 80 feet, all the glass in the windows of the room was melted, yet the building remained unhurt.

WHITE'S PATENT TENSION RAILWAY.

FIG. 1.

Perspective view of Support Pile, Block, Rail, Wedges, &c.

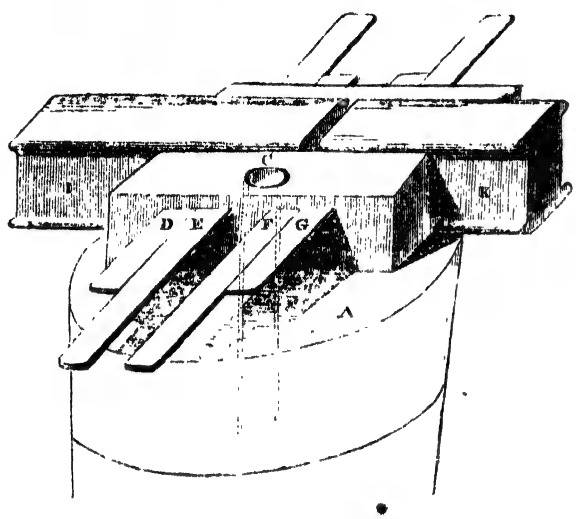


FIG. 3.

Plan of Support Pile, Block, Rail, Wedges, &c.

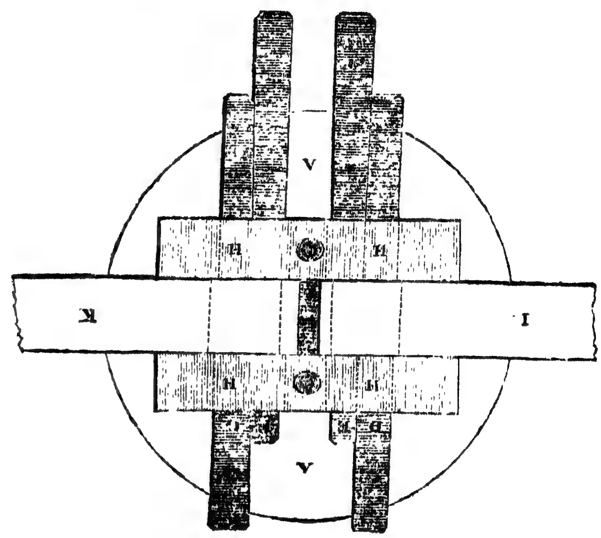


FIG. 2.

Longitudinal Section of Support Pile, Block, Rail, Wedges, &c.

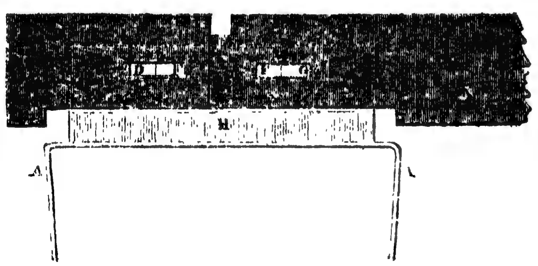
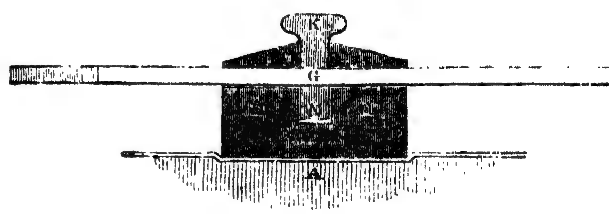


FIG. 4.

Section of Rail, Block, Wedge, &c.



SPECIFICATION.

The nature of the invention consists in adding strength to such metal rails and bars as may be used for railways, and also to such timber beams, supporters, and bearers, as may be used in the construction of bridges and viaducts, by giving tenseness to the same by means of keys or lateral wedges as hereinafter described.

Figure I. represents the invention as applied to railways, A. being what is called a resistance pile, with one of the patentee's blocks or chairs, with its wedges for giving tenseness to the bars, which form the rails fixed upon it; H. is a block of iron sunk into the top of the pile A., and there spiked down by spikes as at the parts marked C.; through this block are cut horizontal mortices to receive the lateral wedges or keys, D. E. F. G., while corresponding mortices are cut in the rails I. K., to allow the wedges to pass through, these resistance piles may be at any convenient distance from each other, say about one-sixteenth of a mile, and between them, at intervals of about fifteen feet, common piles should be driven to receive similar blocks of a similar size, and fastened down by spikes passing through holes sufficiently larger than the spikes to admit of the play consequent upon expansion and contraction; I. K. represent portions of railway rails, their ends being slid into groves cast to receive them in the block H till the mortices in the block and those in the rails sufficiently correspond to admit of the introduction of the small ends of the wedges, but leaving a sufficient space between the two ends of the rails to admit of their being extended by tension, or of their expanding with increase of temperature. The rails being so placed, the wedges or keys D. E. F. G. are inserted and driven up, and if the resistance piles are sufficiently braced and strutted not to yield by the driving of the wedges, any required tension may be given to the rails. Fig. 1 is a perspective elevation of one of the support piles; fig. 2 is a longitudinal section; fig. 3 is a plan and fig. 4 is a transverse section. It is evident from the foregoing that, if two fixed points be obtained at each end of any metal bar used as a beam or support, or as a stretcher, or a bearer, in the construction of any bridge or viaduct, tension may be given to it by means of blocks and lateral wedges, similar to those hereinbefore described, and by means of that tension additional strength imparted to the said bar, and, likewise, to any timber beam, support, or bearer, so used. The Patentee claims as his invention the application of tension in manner aforesaid, to all such metal rails and bars, and also to all such timber beams, supports, or bearers, used in the construction of railways, bridges, and viaducts, as are capable from their nature and situation of having such tension as aforesaid applied thereto, whereby he imparts great additional strength or power of resistance to the said metal rails and bars, and to the said timber beams supports, or bearers.

STEAM BOILER ALARUM.

COMMUNICATED BY MR. HENRY DYOTT GARDNER.

Fig. 1.—Interior of Boiler; side view of Apparatus.

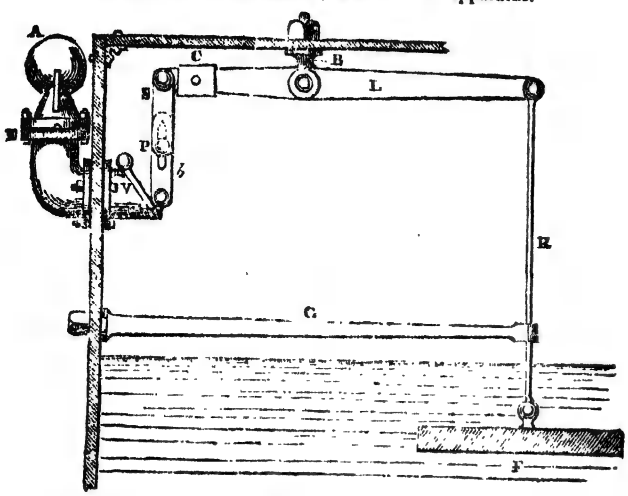


Fig. 2.—Plan of Apparatus.

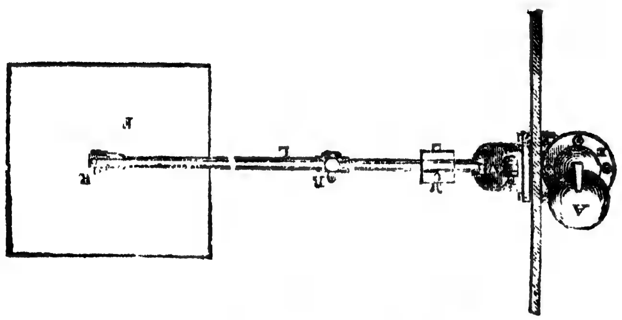
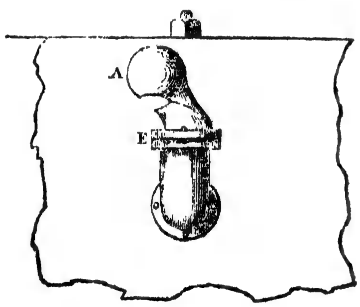


Fig. 3.—Front view of Alarum or Whistle.



REFERENCE TO FIGURES.

F float, which is connected to the lever by the rod R; S, slings; b, link; P, pin which connects the slings together, passing through the link b; V, valve; A, alarum; G, guide to prevent the float rod oscillating; B, fulcrum to support the lever, and is fastened to the upper part of boiler by means of the nut on the outside.

At E a small valve is introduced to prevent the air entering the boilers, when being pumped up by what is generally called the vacuum pump.

The frequent accidents which have lately occurred to the boilers of marine engines, in consequence of the water becoming too low, whereby the plates are over heated, induced me, within the last few weeks, to seek for a method by which such accidents may be avoided, by the Engineer in charge having timely notice when the water in the boiler descends below a certain level. Annexed is a drawing, showing an apparatus I propose for preventing such accidents; it consists of a float F., attached by a rod R. to a lever L., about two feet long; the other end is connected to a valve V., of about two inches in diameter, and attached to a pipe E. in front of the boiler, with an alarum or whistle A. at the end. I propose the float F. to be a piece of flagstone, which must displace as much water as is necessary to overcome the resistance of the steam acting upon the valve V., &c.; the dimensions may be about thirteen inches square, and two inches thick; counterpoised (when suspended in the water) by a weight C. upon the opposite end of the lever L., the preponderance being given a little in favour of the short end, which is connected to the valve V. by means of a link B., and slings S., with a pin P., which passes through the link, and allowed to play freely; this mode of connection permits the float to oscillate, should it have a tendency to do so, without disturbing the valve. When the water sinks below a certain level, that is, under the upper edge of the float, its gravity will cause it to descend, thereby depressing the long end of the lever, the short end being proportionally elevated until the pin in the slings comes in contact with the upper part of the link; at this juncture, upon a farther descent of the float taking place, the valve is opened, and the consequence will be an escape of steam, which lifts the small valve at E., and rushes through the pipe, and out at the orifice in the alarum, and whistles, thereby giving due notice to the engineer in case of danger. To prevent corrosion, the apparatus had better be made of metal, and the pins and joints allowed to work free.

HENRY DYOTT GARDNER.

Near the Howick, Woolwich.

[A steam whistle has been many years in use for the purpose of an indicator, to denote the descent of the water in steam boilers below the proper level; the method is to pass a piece of gas or small pipe through the boiler, one end to be as high as the feed head, and the other to extend within the boiler, as low as the water may be allowed to descend with safety. When the water passes this point, the steam rushes through the pipe and sounds the whistle. In Government steam boats a similar pipe is carried up the side of the funnel, until the altitude of water in it is sufficient to counterbalance the pressure of the steam; it then returns in the shape of a syphon to the stoke-hole; if the water gets below its proper level, the steam rushes through the pipe, and acts in a similar manner to that we have just described. Both these methods are only applicable to low pressure boilers, and are liable to serious accidents on board of steam vessels, particularly war steamers; for if a cannon shot, or any other disaster, were to carry away the pipe, the consequence would be, that the water, to a certain depth, would be blown out of the boiler, during which time no person could approach to check it.

We have lately seen another contrivance, adopted by Messrs. Maudslay and Field, for high pressure boilers, which we believe acts in the following manner: we only saw it for a few minutes; probably some part of the description may not be exactly correct in detail:—A tube is fixed perpendicularly to the top of the boiler, part within and part without; a small pipe is made to fit very accurately the inside of this tube, through which it passes; the pipe has two apertures, and is made longer than the external tube; one of the apertures is near the top, and the other about a third from the bottom of the pipe; to the end is suspended a float, similar to that shown in the above drawing; the top or upper part is attached to a chain, which passes over a pulley, and suspends a balance weight, which is so adjusted as to allow the float to be suspended at its proper level, and the lower aperture of the pipe to be enclosed within the tube, consequently no steam can pass through the pipe; but if the water in the boiler sinks beyond its proper level, then the float descends and pulls down the pipe, until the lower aperture is below the tube, when the steam immediately rushes through the pipe and out at the upper aperture, and produces a noise similar to a whistle. This is a very simple and excellent contrivance for steam engines on land, but for marine engines it is liable to the same objection as to the last method described, in consequence of the apparatus being above the boiler. The contrivance of our correspondent, Mr. Gardner, is applicable for both high and low pressure boilers; and, as nearly the whole of the apparatus is fixed within the boiler, and all below the deck of a steam vessel, it is not liable to those accidents we have enumerated. We consider the simple introduction of a steam whistle ought to be adopted for all steam engines; the cost is comparatively trifling. —Ed.]

TASTE AND THE FINE ARTS AT OXFORD.

It is certainly one of the great features of the present age, that it has not only created new establishments, but that it has given an unusual impulse to the old ones, and in many cases roused them from their slumbers. No where perhaps has this spirit produced more effect than in our universities, and particularly at Oxford. More perhaps has been expended on repairs in the last ten years, than probably in the whole century before, and the corporations feeling themselves under the public eye, have been induced to devote those revenues to their original destinations, which in many cases had been diverted to personal objects. It is a subject of congratulation, too, that in carrying out the recent improvements, a proper attention has been shown to

preserve and restore the original styles of the buildings, and maintain their purity. Among the latest of these restorations are those effected in the Cathedral of Christ Church, where several of the details have been reproduced, which had been destroyed or concealed by the barbarism of former architects. With the progress of the works now going on in our cathedrals, we shall in a few years stand without rivals in this splendid branch of Gothic architecture, and we trust that the purification of the style of the edifices, will be the signal for a revival of the splendour of those admirable schools of art, from which our fathers produced so many triumphant works.

In the chapel of Magdalen College is a curious discrepancy. As is well known, the interior is in the pointed style, but on the steps of the altar have been recently erected two magnificent metal candelabra. Those are as purely Greek, and as dissimilar from the style of the surrounding objects as possible; but they are still farther distinguished by another feature: the glasses being considered of an inelegant shape, in the attempt to rectify this fault another anomaly was created, a Gothic quatrefoil rim being placed round the glasses.

It is worthy of remark, that the collections of Oxford contain perhaps a greater proportion of unnamed pictures than in any other gallery, and it is a practice which is well worthy of imitation, and particularly in the Trafalgar Square exhibition. Nothing can be more mischievous to the public taste than to give suppositious names to works, which can generally do quite as well without any name at all. It is doubtless from this system of imposition that a bad standard of criticism has been created in England, and gulled our connoisseurs into the purchase of more trash, than is to be found in all the other nations of Europe. The National Gallery, with its Andrea del-Sartos will vouch for this; and, indeed, in most details of administration it is far behind the collection in Christ Church College, in which latter the works are at least arranged according to masters, and all the early artists are brought together in a manner that enables the eye at a few glances to view the whole progress of the art.

But while we are disposed to give great credit for the general disposition of the collections, we feel it our duty particularly to reprobate the manner in which the Pomfret gallery is conducted. This, most of our readers are aware, is composed of a number of antique statues, and fragments collected by the Earl of Pomfret, and by him presented to the university. Will it be believed, that in the richest university in the world, that this collection is worse arranged than any wax-work in Bartholomew fair? and yet such is the disgraceful fact. The room, called the School of Metaphysics, or some such name, has very much the appearance of a barn; and the collection, which is under the superintendence of the Clerk of the Schools, is exhibited by an old ignoramus, not fit for a two-penny showman. After paying a shilling to this Mercury, the visitor finds himself in a large dirty hall, with a badly written manuscript catalogue lying on a table. The statues and fragments generally rest upon remains of old boards and shutters, and the numbers are scratched upon them with a bit of charcoal. In fact, there is no collection in Europe, and we have seen many, which at all approaches in inattention and neglect to this beggarly display, and it is the more inexcusable when a sum of ten pounds and a common painter would at any rate suffice to put it in a more respectable condition. We should be happy to see the attention of the heads of the university called to this flagrant disgrace, for we feel assured that men who display so much reverence for even a letter in a Greek manuscript, would not willingly suffer such disrespect to these monuments of ancient art.

ANALYSIS OF STONE.

We last month gave a translation from the German of the experiments on stone at Munich, and we are happy to find its utility confirmed by the course proposed to be adopted with regard to the stone for the new houses of Parliament. Mr. Barry has been on a tour with Mr. De la Beche, the geologist, to examine the stone in different quarries, and having brought back many specimens, they are now about to subject them to the test of chemical analysis The importance of ascertaining the durability of the means of construction is apparent to every one, and it would be well had such a practice been adopted at an earlier period. Without alluding to St. Paul's, the recent repairs of the bridges urge the necessity of this, and enforce the economy of using a better stone in the first instance, rather than by using cheaper, or more available materials, incuring future expenses for repairs. The shelly buildings at Oxford, which are now being faced with other material, do not serve as an example to prevent the use of similar bad stone in other buildings there. From a want of attention to this point, tomb-stones, intended for perpetual memorials of mortality, in many damp parts of the country fall into dust almost as soon as the being they are intended to commemorate.

ON THE LAYING OUT A LINE OF RAILWAY PREVIOUS TO EXECUTION.

Sir,—Thinking it might be of service to some of your readers, I send you the following hasty observations on the above subject; if acceptable, I may at some future time send you something more worthy of your pages.

The first step in carrying a line of railway into execution, is to have the centre line accurately set out; to do which, with any pretensions to accuracy, a theodolite must be used in every part of the operation. Indeed, it is utterly impossible that a line can be set out perfectly straight for ever so short a distance without it.

It is not my intention at present to go into the method of setting out the centre line any further than to recommend that curves be put in, in the manner explained by Mr. Henry, in the Railway Magazine, and also in my treatise on "Engineering Field Work." It is the only way that I am aware of in which subdivision of labour may be applied; and I can state from experience, that it is the most convenient. My object at present in addressing you is to point out the very erroneous manner in which the various widths required for a railway are often put in. As I have mentioned above, the centre line is (or should be) first set out. Stakes being driven at equal distances of one or more chains apart, the section is then taken on this centre line, without regard to the inclination of the ground on either side. Sometimes, indeed, cross sections are drawn on the principal section; but this is quite useless, so far as the widths required for any given cutting or embankment; for in the first place, without these cross sections are taken at the exact points, or in fact from off the stakes on which the principal section ought to be taken, they are quite useless, any further than to give a general idea of the inclination of the ground. I have observed on many lines of railway, where the centre line has been on sideling ground, that square, or equal widths from the centre line have been marked not only on the plan, but on the ground. What could be more erroneous? Take for instance an embankment of 20 feet, with slope 2 to 1, the width required on level ground would be double that on each side the centre line; plus half the width of roadway and ditching, but the latter being a constant quantity, must be omitted in the calculations. Suppose the ground to be sideling, and at the estimated distance for level ground from the centre line, the fall should be 10 feet, the extra width required would be that quantity multiplied by the slope, which would be 20 feet; but there would probably be a fall of say 4 feet in this additional width, which again multiplied by the slope would give a further quantity of 8 feet, to be added to the above, and in this 8 feet there being probably a still further fall of 18 inches, would make 3 feet additional; it will thus be seen that in the above case an additional width of 31 feet on one side of the road would be required, more than was calculated on. This is no trifling matter, as it would be found, when the work was carried into execution (if not before), additional land would have to be purchased at most likely an enormous price, or perhaps property would be required that was not in the first place contemplated, and which might not be to be had at any price. Retaining walls, or quickening the slopes, might perhaps get over the difficulty, but the evils are too apparent to require further comment. On the other side of the embankment, if the ground continued at the same rate of inclination, a great part of the estimated width would not be wanted; the actual quantity to be deducted from that estimated for level ground, from the centre line, would be twice the difference of level, or 20 feet minus the fall in that distance multiplied by the slope, which taking the fall as before at 4 feet would be 20 feet—8 feet=12 feet; to which is to be added twice the difference of level of this last quantity, which, as we took it before, is 3 feet, the total quantity to be deducted would then stand thus: 20 feet+3 feet—8 feet=15 feet. It should be carefully borne in mind, that in cutting the preceding operation is reversed. By the above method it will be perceived that the whole of the widths of any line of railway must be put in with the spirit level, which may at first appear tedious and complex, but in reality it is not so, and with a little practice can be very quickly done; and, moreover, the only method (that I am acquainted with) by which it can be done with any pretensions to accuracy.

Charlotte-street, Bloomsbury. PETER BRUFF.

SUGGESTION FOR OBTAINING PROFESSIONAL INFORMATION ECONOMICALLY.

Sir,—Allow me to suggest, through the medium of your valuable Journal, to the young members of the profession of Civil Engineer and Architect, a manner of obtaining such printed information at moderate prices, as the present system of book-making and luxurious engraving places beyond the reach of their not too well filled pockets. It has become a sad truth that a young man who, wishing to purchase a professional library, should make choice of the works published by the men who are considered the heads of the profession, will, when he has with difficulty spared five or six guineas to buy one work, find it to contain but a small portion of what may be useful to him. On the other hand, he will probably find many beautifully (expensively) executed drawings, different from one another merely in consequence of some slight, and unimportant variety of ornament or dimensions, in no degree affecting the principle; or many plates in succession occupied, or partly occupied, by copperplate engravings that might easily have been condensed into a page of type or woodcut, or, at any rate, into one copperplate outline instead of a dozen finished (and five shilling) engravings. Should another hard-earned and hardly-spared five guineas be laid out on another author's production, there will be found the same subject, and the same drawings (or, otherwise, similar drawings) of the very same things, while a large portion of the text will probably consist of copies of Acts of Parliament, compliments to directors of companies, or examinations of evidence in committees, given (as the author generally tells you, with consummate *nonchalance*) in the very words.—Thus:* "Mr. S. was requested to state to the committee the result of his observations, and the following questions where put to him:"—Q. Do you think that, in case of the velocity being infinitely increased, the continuous bearings would give way; and if not, what is your opinion?—A. I do not think that, in case of the velocity being increased to an extreme degree, that the continuous bearings would give way; but my own opinion is, that in such circumstances the said bearings would not give way. Or Mr. B. makes the following observations:—"The strength of the rails," he observes, "may &c." Now if this verbiage were got rid of, not only would the subject be more intelligible and more attractive to readers, but ponderous folios might be exchanged for compact quartos,

* I would not copy from one work in preference to another. Your readers will remember many examples of the kind I have represented (hardly in caricature?).

and by reducing the size of the type,* and using thinner paper to pocket duodecimos—fit and agreeable companions for the field. I would propose the association of the younger members of the profession: that a library of reference for one copy only of the best works be bought. Let a committee of their own members be selected by ballot, who should select from these works the most useful treatises and drawings, and let these be condensed (an operation which a little practice would render easy to any tolerably good clerk) and printed in a neat and economical manner. I would also observe, that, although there is abundance (numerical, at least) of elementary works, there is still great want of books on the details of practice. Those who have to do with details, are generally too hard-worked at that practice to have time or inclination to write about it, and they imagine that what is familiar to them must be so to others. This I take to be the reason that a catalogue of books on engineering or architecture may be divided, without exception, into theoretical elementary works, and histories of works of such magnitude as occur but rarely, and fall to the lot of only a few. We want also an account of the numerous instances in which works have failed, with the best assignable causes of such failures. If works fail from the want of skill of those who direct them, the public ought to know it; if from other causes, the reputation of the architect or engineer will be bettered by their being made generally known. Navigators place buoys to mark shoals and rocks that should be avoided, and steer boldly into the open sea. Were buoys to be placed on the dangers of science, we might also steer out into the open; and though new shoals and rocks would cause new shipwrecks, new discoveries would be made, and the interests of science better served, than in keeping, as at present, to an inshore navigation.

Yours, &c., B.

ARCHITECTURAL SOCIETY.

SIR,—In your last number there appeared a letter, bearing the signature of "T. Square," which I think calls for a few observations, and to which, in justice to those gentlemen on whom it seeks to throw a slur, you will, I am confident, give a place in your next number.

It would be an invidious and difficult task to decide who formed the "chief members" of the Architectural Society; those who have seceded or those who remain. It would first be necessary to determine whether talent, or zeal, or liberality, or whether the circumstance of being amongst its earliest adherents, constitute the title to chieftancy. But, so far from its being the fact, that the Architectural Society is still composed of those gentlemen who (as it would be inferred exclusively) "ever took its interests into their consideration, and supported it by their exertions, abilities, and funds," I will venture to assert that the list of those members who considered that a junction of the two societies would be advantageous to the profession generally, and who have seceded from that to which they originally belonged, because they believe the Institute of British Architects better qualified to carry out the objects they have in view, and because they felt regret at what appeared to them prejudice and unreasonableness on the part of those who were dissatisfied with the terms proposed, contains the names of gentlemen whose unremitting exertions, whose abilities and generosity, will fully bear comparison with any who may remain; and whose zeal and pride in the Architectural Society was unquestioned, until her numbers had decreased, and apathy had usurped the place of that energy and spirit, which was her strong ground.

Your correspondent lays great stress on the laudable exertions of those gentlemen who "established that institution," and to several of whom he is known, his acquaintance must be somewhat limited if he fancies they all remain, or were subsequently its most useful members; of 15 of the earliest members, eight have seceded, two are abroad, and five remain, of whom one is a strong advocate for the union of the two societies, and one rarely attends the meetings.

It is unnecessary to recapitulate the arguments which were used in favour of uniting the two societies; they have failed to convince the prejudiced feelings of those to whom they were addressed; the public have, however, to learn that ours is the profession of all others which possesses sufficient power and influence, and is strong enough in the number of its followers to admit of two distinct societies being advantageously carried on.

You announce the probable accession to the Architectural Society of Messrs. Tite, Savage, Ianson, and Smith, and to the respectability of these gentlemen I gladly bear testimony; but, Sir, I have heard so often of their intended adherence, without seeing it confirmed, that like the person in the fable, I have at last learnt to mistrust the cry of "Wolf." I do, however, regret that their zeal in the advancement and high-standing of their profession had not induced them to give the benefit of their co-operation to the Architectural Society, at a moment when her members were zealous and succeeding in their efforts, and when their advice and assistance would have been invaluable, rather than to withhold it until disagreement and separation had nearly broken up the society, and when their adherence may admit of other motives being put upon it, than the pure and laudable ones, which at an earlier period would have been an undoubted consequence.

I could say more on the "modesty of your correspondent's remarks about a new era in architecture," who, by a process of reasoning only known to himself, confines the "foundation" of this wonderful superstructure to Lincoln's Inn Fields; but I have already trespassed too much on your attention, and will merely add a corrected list of those who have resigned as members of the Architectural Society.

I am, Sir, your very obedient Servant,

STRAIGHT EDGE.

T. H. Wyatt, Vice-President and Trustee; T. L. Walker, Hon. Treasurer, J. B. Watson, late Trustee; George Moore, O. Jones, H. Duesbury, D. Brandon, and B. Ferrey, Members of the Committee; W. Wright, H. Flower, J. Johnson, E. Woodthorpe, T. T. Bury, C. Lee, C. Parish, and C. J. Peirce, Members.

IVISON'S PATENT APPARATUS FOR ECONOMY OF FUEL, &c.

SIR,—In your last number of the "Engineer's and Architect's Journal," I perceive a succinct account of Mr. Ivison's arrangement for throwing steam on the fuel, in order to effect a perfect combustion of smoke. When the account was published in the *Times* and other journals, I concluded that the patent involved some peculiar arrangement for the above purpose; but the extract contained in the Journal, evidently furnished by the friends of Mr. I., disabuses me of the erroneous conclusion I had formed, since therefrom it clearly appears that Mr. Ivison lays claim to the *principle*, and not to the peculiar arrangement: indeed, the plan of the bridges, for the precipitation of the ashes and refuse of the fuel, is a mere hint; it is the combustion of the vapour is the grand invention—no more, no less. Now, if this really be the case, I am afraid Mr. Ivison and his friends have expended time, labour, and expense, to little purpose. For my own part, I would as soon have taken out a patent for throwing salt upon the fire as a consumer of smoke, as for throwing steam—since I believe both one and the other have been in use from time immemorial. It is far from my wish to deprecate a useful invention: I merely wish to ascertain the simple fact, whether, when a person has, in the common routine of his employment, been in the habit of carrying into practice a certain principle, and that for a number of years—whether, I repeat, any other individual can, by slightly modifying the arrangement—for such I shall presently show is all Mr. Ivison can lay claim to—take out a patent thereupon, and henceforth compel the public at large to pay 1*l.* *per horse power* per annum (I quote the words of Mr. William Watson, of Main Point Foundry, Edinburgh). During my term of apprenticeship, served in the south of England with a manufacturing chemist, it was our invariable custom, when we wished to procure strong red heat in our furnaces, to throw water on the heated ashes in the pit, in order that the vapour thereof, impelled by the draught, should pass upwards through the grate and be there consumed by the red-hot coal. Observation had taught those who instructed me that water, either in the form of a vapour or a liquid state, would materially assist combustion; and not only the blacksmith who sprinkles his fire, but if I remember right, several others, in their experiments, have proved that water, particularly in the diffused state of vapour, materially assists in procuring a bright clear fire, or in consuming its own smoke.—Vide "Arnot's Elements," Physics.

So well did this principle of impelling vapour through or against the burning fuel, to effect a more perfect combustion, appear to be understood, that our ashpits were constructed water tight and deep, and it was customary with us, when we wished to procure an intense heat and a very clear fire, to introduce the water into them in a boiling state. Now Mr. Ivison's modification appears to be merely a substitution of the steam-boiler for the open moistened ashes; in his case the aqueous vapour is admitted from above; in ours, and in a thousand others, I have no doubt it is the same, the steam rises from below, being generated by the ashpit. If he rests his claim on the circumstance of the steam coming from above, the blacksmith opposes him, for this latter worthy with a bundle of moistened rushes in his right hand, throws his steam or condensed steam down on to the fire; and if Mr. Ivison rests his claim on the steam in a rarified state commixed with air as a supporter of combustion, there is scarcely a stoker in England who could not prove it as no invention. Had Mr. Ivison, of the Castle Silk Mills, Edinburgh, been at the cost of expensive apparatus—had he devoted much time, or beyond all, had he evinced considerable tact and ingenuity in his invention, or had he aimed merely to convince his employers, Dr. Fyfe and Mr. William Watson, that he was a very clever fellow, I should have remained silent; but when a plan is proposed, whereby southern plying steamers are to be saddled with an impost of 1*l.* per horse power per annum, I trust they and all others connected with steam will protest against such an undeserved and unearned monopoly. There is a gentleman of considerable talent and ingenuity in all matters connected with gas works, and many others indeed, Mr. Rutter, of the Brighton branch of the General Gas Company's works, who has made some experiments on the assistance water and steam affords to combustion, I call on that gentleman, although I have only once in my life had any conversation with him, and that took place several years since, to communicate whether this principle be Mr. Ivison's discovery or its application new. Trusting, Mr. Editor, that this inquiry may be either speedily answered by Mr. Ivison, or that his pretensions may, by an examination of their merits, be duly estimated, I beg leave to subscribe myself,

Respectfully,

Oct. 2, 1838. A. SOUTHRON, Engineer.

SIR,—On reading in the last number of your valuable publication the account of Mr. Ivison's invention, for saving fuel and preventing smoke, I could not but regret that the parties who had made the experiments had not been more particular in giving the real quantity of steam employed to produce the effects enumerated; I should therefore wish to direct the attention of some of your

* For my part, I wish all large type were melted up, or, at any rate, used only for title-pages, bill sticking, and advertisements. My eyes, certainly, are young and good; but were they otherwise, I hope I should not wish to impose the penalty of large type and dear books upon those who had still to struggle onwards when I had reached the goal. I hope I should then be content to read with spectacles.

numerous readers (whose occupations may permit them) to ascertaining the quantity of steam necessary to be introduced into the furnace for a given weight of fuel to produce the greatest useful effect, and prevent thus the loss of steam which would be occasioned by emitting more than is absolutely requisite. Such a superfluity might probably produce an injurious effect, so that we should be enabled to ascertain the real economy effected by the employment of this valuable discovery.

Another point to which I am desirous of directing the attention of your readers, is the possibility of introducing partially, if not wholly, into the furnaces of the non-condensing engines, steam which is now suffered to escape into the air. The steam which might not be required for this purpose could be introduced at the bottom of the chimney, producing then as in locomotive engines, a greater draught, and doing away entirely with the necessity for such elevated and costly structures as the chimneys now used. By this application also the smoke might be consumed, and a greater draught obtained.

I believe that this would be quite practicable, as the pressure against the motion of the piston will not be augmented, if the tube, which leads to the furnace, be of sufficient diameter, and the aperture large enough to give it free egress; besides, on account of the draught of the fire, it will rush as it were into a partial vacuum.

The advantage of this plan is evident, if there be no practical difficulty to prevent its application, as in this case the saving of fuel would be effected by the use of steam which was before lost; consequently the whole quantity saved is real economy, whilst by letting the steam from the boiler into the furnace, part of the fuel is employed in producing this steam, which is not utilized by the engine, and which must necessarily reduce the real economy considerably.

I take the liberty of transmitting to you these few observations for insertion in your truly excellent journal, should they meet with your approbation, as they may thus fall under the notice of some of your readers who may have the opportunity of applying them; for if the whole economy proposed by Mr. Ivison's experiments were thus realized, it would render the high-pressure non-condensing engines the most valuable.

Yours, &c.,

October 19th, 1838. C. S. M.

THE EFFECT OF GRADIENTS ON RAILWAYS.

(From the Irish Railway Report.)

The term gradient has been adopted to indicate those slight inclinations up which a load may be taken, although with a diminished velocity, without assisting power; being thus distinguished from those steeper slopes, termed inclined planes, where assisting power, either stationary or motive, is intended to be used, according to the general practice of the road; but these latter may still be ascended with small loads by the power of the single engine only, so that, in fact, there is no distinct limit between those slopes and the former; it will, however, be generally understood that a gradient is a slope of small inclination.

If the power exerted by a locomotive engine were wholly applicable to the traction of the load, that traction being a determinate fraction of the weight moved, then in ascending a gradient whose inclination is expressed by a fraction represented by the height of the plane divided by its length, the engine power required for the ascending plane would be to that on the horizontal plane, as the sum of the two fractions (viz., that which expresses the angle of the plane, and that which represents the friction) to that which expresses friction only.

Thus, if, as is commonly the case, the friction and surface resistance is 8lbs. to the ton, or $\frac{1}{280}$th part of the load, then, in ascending a gradient of $\frac{1}{280}$ the required force would be double that for the horizontal plane, and so on for any other proportions. But this is true only of the force of actual traction, and not of the power expended by the engine.

To know the relative engine power requisite in these two cases, we must take into consideration the part of that power which is necessary in order to put the engine itself into a condition to move, that is, the power requisite to overcome the friction of the engine gear, without a load; the surface resistance, and the friction of its own axles and wheels, as well as those of its tender; and lastly, the resistance or pressure of the atmosphere against which the pistons are constantly acting.

These forces together, which must be all overcome by an expenditure of steam power, and a consequent consumption of fuel, before the surplus power can become applicable to traction, amount, as we have seen, to nearly one-third of the whole; and as this amount of absorbed power is the same either on a horizontal or on an inclined plane, the relative force or steam power requisite in the two cases, will be very different from that of the force necessary for traction only, and will vary very essentially according to the amount of the load the engine is employed in drawing, the dimensions of the engine itself, and the inclination of the plane.

In order, therefore, to estimate correctly the effect of gradients on the expense of working a line of railway, we must first inquire into the amount of steam power absorbed in overcoming the resistance to which we have referred. We have not thought it expedient to enter upon these several reductions in the body of the report, but by referring to the note below, the several results derived from them will be found arranged in a tabulated form.

In the note referred to, is shown the amount of duty which a first-rate locomotive engine is capable of performing on a horizontal plane; our immediate object now is to show how much that performance will be reduced on the supposition of certain planes and gradients occurring on the line of way.

We must observe, however, that these reductions will not affect in an equal degree the cases of minimum and maximum traffic; because in the former the duty performed by the engine is not limited by its want of capability, but by a want of due employment; the effects we have traced, therefore, principally apply to cases of abundant traffic. By referring to the note quoted it will be seen that the effect of a gradient in retarding the load, and therefore leading to an additional expenditure of steam power, varies with the amount of the load, the dimensions of the engine, and the degree of inclination. Taking a medium engine and gross loads of 100 tons and 50 tons, that is, including engine, tender, and waggons, it appears that the expenditure of steam power, including the absorbed power, necessary to overcome a resistance of $\frac{1}{280}$th of the load is expressed by $\frac{1}{150}$th of the same, when the gross load amounts to 103 tons, and by $\frac{1}{97}$th when that load is 50 tons. While, therefore, the power of traction is doubled in ascending a gradient of 1 in 280, the requisite steam power will only be increased about one-third with 100 tons, and by little more than one-fourth with 50 tons.

It is important to attend to these facts where only a moderate traffic can be expected, as it will serve to show the impolicy of expending large sums in the formation of great excavations, embankments, &c., in cases of minimum or moderate traffic, although they might be perfectly justifiable where the traffic is likely to be abundant. For, in the latter instance, not only do the gradients retard the speed, and thereby increase the expenditure of steam power, but they have a still more injurious effect by limiting the amount of load which the engine is capable of conveying; it being obvious that a large load, yet such as the engine would be fully capable of drawing along a horizontal plane or medium gradient, might be altogether beyond its power on a plane of certain inclination. In such cases, therefore, a considerable expenditure might be advantageously incurred in the first outlay in reducing the gradients, which would be altogether useless on a line where only a moderate traffic is to be expected.

NOTE.

It is difficult to illustrate and compute the effect of gradients generally, without entering on the subject mathematically, which it is desirable, if possible, to avoid.

A great deal of controversy has taken place in reference to the theoretical principles of this question; but the Commissioners, unwilling to embarrass the Report with controversial matter, have taken the best means in their power to ascertain the actual practical effects of the gradients on the lines at present in operation; and it is on these, and not on any particular theory, the following calculations are founded.

It is agreed on all sides, that the additional force requisite to urge a load up an inclined plane or gradient, is such a fraction of the gross load (that is, with engine and tender included) as expresses the slope of the plane, or the fraction of the height of the plane divided by its length.

The disputed point is, what is gained by the returning load descending the same plane? It has been maintained, that the power which is lost in causing a load to ascend a plane is gained by an equal returning load descending the plane; a deduction, however, which has been controverted by others. Without stopping here to discuss this question, the Commissioners will state the facts they have been able to collect on the subject, and which have been obtained by proposing the following queries to the engineers of the several present existing lines:—

First.—When a plane inclines so much as to give to the engine and load a tendency to acceleration, what is the greatest velocity it is deemed prudent to descend with, in comparison with the usual horizontal velocity? or, to specify more particularly, what velocity would it be deemed prudent to descend with on slopes of $\frac{1}{80}$, $\frac{1}{100}$, $\frac{1}{110}$, $\frac{1}{120}$, &c., supposing the horizontal velocity to be 25 miles per hour?

Second.—What is the greatest slope on which it is deemed prudent to allow of acceleration, and to what amount?

Third.—On medium slopes, what may be considered the excess of allowable descending velocities beyond the mean horizontal velocity?

The answers to these queries were not entirely accordant; but it would appear that no advantage can be claimed for descending planes of greater slope than $\frac{1}{140}$, and that the greatest allowable increase in the descending velocity on planes between $\frac{1}{140}$ and $\frac{1}{250}$ is one-fifth of the uniform horizontal velocity: on less slopes than $\frac{1}{250}$, the gain from descent varies from one-fifth to nothing.

It appears, therefore, that whatever advantage may show itself theoretically on descending planes, there is no practical advantage for those of greater slope than $\frac{1}{140}$; and allowing an advantage of one-fifth additional velocity for planes of less slope than $\frac{1}{140}$, and greater than $\frac{1}{250}$, we are in general on the most favourable side.

It may be said that these descending velocities are obtained with less piston

pressure, which is true; but the steam thus saved in the cylinders is commonly lost at the safety valve, so that there is little, if any saving of steam beyond what has been stated.

One or two cases may now be taken by way of illustration.

Let us suppose a load of 88 tons (tender included) to be drawn along a level plane at the rate of 20 miles per hour, and that this engine and train arrive at a rising plane, sloping 1 in 140; the engine being of the first class, viz., weight 12 tons, and tender 6 tons:—

First, It appears by Table 1, vide Journal, No. 13, page 343, that the power absorbed is . . .	1075lbs.
88 tons, at 9lbs. per ton	792
	1867lbs.,

which is the pressure required on the horizontal plane.

To this is to be added the additional traction necessary to cause the loads to ascend the place; we must now, therefore, add the weight of the engine itself, 12 tons; making the whole load to be raised 100 tons, or 224,000lbs., and $\frac{1}{140}$th part of this is 1600lbs. additional traction. But it has been seen that every 8lbs. traction causes 1lb. additional friction on the engine gear; this makes 1800lbs.: the whole required force now therefore is 3667lbs.; and the velocity being inversely as the pressure, or force of traction, we have 3667 : 1867 : : 20 : $10\frac{1}{5}$ miles, the velocity of ascent: that is, the time of ascending will be nearly double that required to go the same distance on a horizontal plane, but in the return the time of descent will be the same as on a horizontal plane; so that ascending and descending a plane of this slope with a load of 88 tons, will require the same time and power as would be necessary to pass and repass a horizontal plane of one-half greater length; or, calling the length of the gradient 1, the equivalent horizontal plane will be 1.5.

Taking now the same engine and load, and the slope of the plane $\frac{1}{500}$, let it be required to find the equivalent horizontal plane.

Here the absorbed power, as before, is . .	1075
88 tons, at 9lbs.	792
Traction on a level	1867

Tons. Tons.

88 + 12 = 100 tons = 224,000lbs.; this divided by 500 gives 448lbs., which is equivalent to the traction of 56 tons on a level; and this, at 9lbs. per ton, is 504 additional pressure. The whole pressure is, therefore, 2371lbs.; and 2371 : 1867 :: 20 : $15\frac{3}{4}$ miles nearly; and as 1867 : : 2371 : : 1 : 1.26 length of horizontal plane equivalent to the ascending plane. And again, $1\frac{1}{5}$: 1 : : 1 : .83 length of horizontal plane equivalent to the descending plane.

$$\begin{array}{r} \text{Whence, } 1.20 \\ .83 \\ \hline 2.03 \\ \hline \end{array}$$

1.015 mean equivalent plane.

It follows from this, that the lengths of the equivalent horizontal planes depend upon the amount of absorbed power of the engines, and the weights of the loads. In Tables 5 and 6 the length of equivalent horizontal planes are computed for gross loads of 100 tons and 50 tons, with engines agreeing in dimensions with what have been denominated the 1st class engines, and Tables 7 and 8, &c., for the same loads with engines of the 2nd, 3rd, and 4th class.

The tables will furnish criterea for determining the effects which different orders of gradients have upon the working of a line of Railway, the load being given; for, by reducing every length of gradient to its equivalent horizontal plane, it will be seen what length of horizontal plane is equivalent to the whole line.

It is to be observed, however, that the effect thus shown is not all the effect that is due to the gradients and planes; for it is these planes which limit the amount of load. If a line is wholly horizontal, and the traffic abundant, the loads may be chosen so as to bring out the best effect; and it has been seen, that the greater the load within the power of the engine, the greater the economy of working; but when it is required to ascend planes without assistant power, the load must be taken such, that it will ascend the plane with a certain velocity.

The engines are thus obliged to work with small loads, and all the loss attending on such loads must be considered to increase to the above disadvantages.

Thus, for example, in ascending a plane of 1 in 140, with a load of 100 tons, it appears by Table 5, that the force of traction would be doubled, or be equivalent to the traction of 200 tons on a level. In order, therefore, that the engine may ascend this plane without assisting power, it would be deemed necessary to reduce the load, probably to 60 tons; and then again, by referring to Table 1, it appears that all the expenses of haulage are increased 36 per cent.; not only, therefore, is the equivalent horizontal plane about one-half longer than the real length of the actual plane, but the expense of working the whole distance is increased 36 per cent.

This points out the advantage of accumulating the ascents as much as possible into short steep planes, and working these planes by assistant engines either motive or stationary: for although there is really no saving of power by this arrangement, there is a saving of time; and what is of more importance, it will not be necessary to reduce the amount of the loads below what would be otherwise considered as most advantageous for the general traffic. These remarks apply to all kinds of loads; but they refer more particularly to those of heavy luggage, where speed is not so essential a consideration as in the passenger trains.

TABLES showing the Lengths of Horizontal Lines equivalent to the several Ascending and Descending Planes stated in Column 1; the length of the Plane being unity, the Gross Load includes Engine and Tender.

TABLE 5.—FIRST CLASS ENGINES. Gross Load, 100 tons.

Gradients or Planes.	Equivalent Horizontal Lines. Ascending.	Descending.	Mean of the two.
1 in 90	2.50	1.00	1.75
95	2.42	1.00	1.71
100	2.30	1.00	1.69
110	2.23	1.00	1.61
120	2.12	1.00	1.56
130	2.04	1.00	1.52
140	1.96	1.00	1.46
160	1.81	.83	1.33
180	1.79	.83	1.31
200	1.67	.83	1.25
250	1.53	.83	1.18
300	1.45	.83	1.14
350	1.38	.83	1.10
400	1.33	.83	1.08
500	1.27	.83	1.05
750	1.18	.83	1.01
1000	1.13	.85	1.00
1500	1.09	.90	1.00

TABLE 6.—FIRST CLASS ENGINES. Gross Load, 50 tons.

Gradients or Planes.	Equivalent Horizontal Lines. Ascending.	Descending.	Mean of the two.
1 in 90	1.99	1.00	1.49
95	1.94	1.00	1.47
100	1.89	1.00	1.44
110	1.81	1.00	1.40
120	1.74	1.00	1.37
130	1.68	1.00	1.34
140	1.64	1.00	1.32
160	1.56	.83	1.20
180	1.49	.83	1.16
200	1.44	83	1.13
250	1.36	.83	1.09
300	1.30	.83	1.06
350	1.25	.83	1.04
400	1.22	.83	1.02
500	1.18	.83	1.01
750	1.12	.88	1.00
1000	1.09	.91	1.00
1500	1.06	.94	1.00

TABLE 7.—SECOND CLASS ENGINES. Gross Load, 80 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	2.60	1.00	1.80
95	2.51	1.00	1.75
100	2 44	1.00	1.72
110	2.38	1.00	1.69
120	2.20	1.00	1.60
130	2.10	1.00	1.55
140	2.03	1.00	1.51
160	1.90	.83	1.36
180	1.80	.83	1.31
200	1.72	.83	1.27
250	1.58	.83	1.20
300	1.48	.83	1.15
350	1.41	.83	1.12
400	1.36	.83	1.09
500	1.28	.83	1.05
750	1.19	.83	1 01
1000	1.14	.86	1.00
1500	1.09	.91	1.00

TABLE 8.—SECOND CLASS ENGINES. Gross Load, 40 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	2.07	1.00	1.53
95	2.02	1.00	1.51
100	1.97	1.00	1.48
110	1.88	1.00	1.44
120	1.80	1.00	1.40
130	1.74	1.00	1.37
140	1.69	1.00	1.34
160	1.60	.83	1.21
180	1.53	.83	1.18
200	1.48	.83	1.15
250	1.42	.83	1.13
300	1.32	.83	1.07
350	1.27	.83	1.05
400	1.24	.83	1.03
500	1.19	.83	1.01
750	1.16	.88	1.00
1000	1.09	.91	1.00
1500	1.06	.94	1.00

TABLE 9.—THIRD CLASS ENGINES. Gross Load, 80 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	2.66	1.00	1.83
95	2.58	1.00	1 79
100	2.50	1.00	1.75
110	2.36	1.00	1.68
120	2.25	1.00	1.62
130	2.15	1.00	1.57
140	2.07	1.00	1.53
160	1.94	.83	1.43
180	1.83	.83	1.33
200	1.75	.83	1.29
250	1.60	.83	1.21
300	1.50	.83	1.16
350	1.43	.83	1.13
400	1.37	.83	1.10
500	1.30	.83	1.06
750	1.20	.83	1.01
1000	1.15	.85	1.00
1500	1.10	.90	1.00

TABLE 10.—THIRD CLASS ENGINES. Gross Load, 40 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	2.14	1.00	1.57
95	2.08	1.00	1.54
100	2.02	1.00	1.51
110	1.93	1.00	1.46
120	1.85	1.00	1.42
130	1.78	1.00	1.39
140	1.73	1.00	1.36
160	1.64	.83	1.28
180	1.57	.83	1.20
200	1.52	.83	1.17
250	1.41	.83	1.12
300	1.34	.83	1.08
350	1.29	.83	1.06
400	1.25	.83	1.04
500	1.20	.83	1.01
750	1.13	.87	1.00
1000	1.10	.90	1.00
1500	1.07	.93	1.00

TABLE 11. FOURTH CLASS ENGINES. Gross Load, 60 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	[illegible]	1.00	1.76
95	2.44	1.00	1.72
100	2.36	1.00	1.68
110	2.33	1.00	1.66
120	2.11	1.00	1.57
130	2.05	1.00	1.52
140	1 97	1.00	1.48
160	1.85	.83	1.34
180	1.76	.83	1.29
200	1.68	.83	1.25
250	1.54	.83	1.18
300	1.45	.83	1.14
350	1.39	.83	1.11
400	1.34	.83	1.08
500	1.23	.83	1.03
750	1.18	.83	1.01
1000	1.13	.87	1.00
1500	1.09	.91	1.00

TABLE 12. FOURTH CLASS ENGINES. Gross Load, 30 tons.

Gradients or Planes.	Ascending.	Descending.	Mean of the two.
1 in 90	2.00	1.00	1.50
95	1.95	1.00	1.47
100	1.90	1.00	1.45
110	1.82	1.00	1.41
120	1.75	1.00	1.37
130	1.69	1.00	1.34
140	1.64	1.00	1.32
160	1.56	.83	1.20
180	1.50	.83	1.16
200	1.45	.83	1.14
250	1.35	.83	1.09
300	1.30	83	1.06
350	1.26	.83	1.04
400	1.22	.83	1.02
500	1.18	.83	1.01
750	1.12	.88	1.00
1000	1.09	.91	1.00
1500	1.06	.94	1.00

NOTES ON CONCRETE.

BY LIEUTENANT DENISON, ROYAL ENGINEERS.

(From the Papers of the Corps of Royal Engineers.)

Since the publication of the first volume of 'Professional Papers,' circumstances have caused me to pay particular attention to the application that has been made of late years of concrete, or artificial stone, to the various purposes of construction; and I shall now briefly state the experiments that I have made or witnessed on this subject, and the conclusions that may be fairly deduced from the results of these experiments.

The first experiment was made with the view of ascertaining whether a mass of concrete, made with Aberthaw lime, would resist the chemical action of water; for this purpose a small block, which had been prepared for nearly two years, was immersed for some time in distilled water, and upon applying the proper test to the water, it was found to have combined with a portion of the lime in the block. Having mentioned this circumstance to Sir M. Faraday, he suggested that it was probable the block contained a quantity of lime in an uncombined state; and recommended that it should be placed in a running stream for some time, in order to wash it thoroughly; this was accordingly done, by suspending the block for two months under a hulk in the river, after which, having again soaked it in distilled water for a week, hardly any trace of lime could be detected in the water by the application of the most delicate tests. This experiment then appears to prove that concrete, composed of proper materials (hydraulic lime and gravel), does not suffer by the chemical action of water. Experiment No. 2 was made in order to ascertain the strength of a block of concrete 2 ft. 6 long, 1 ft. 6 broad, and 1 foot deep, which had been made for two years, and would have been used as a stretcher in the river wall at Woolwich. A shackle was placed round the centre of the block, and two others at the extremities, at a distance of 11½ inches each from the centre; a force being applied to the two end shackles by means of the hydraulic press, the block broke in the centre, under a strain of 4 tons 11 cwt. I did not prosecute the experiment upon the strength of this material any further, having sent down some blocks to Colonel Pasley, R.E., who was investigating the same subject, and the results of whose experiments are as follows:—

Three stones, each 3 feet long, 18 inches wide, and 15 inches deep, were supported upon props 27 inches apart; weights being then applied to the centre of each, the first broke with 6285lbs., the second with 5141lbs., and the third with 2930lbs. This last had probably some flaw; taking therefore the mean of the two first only, the result will be 5713lbs.

A piece of York paving, 7½ inches deep, 13 inches wide, and the same distance (27 inches) between the supports, broke with a weight of 13,512lbs. The value of the constant S, in these two cases, deduced from the formula $S = \frac{lW}{4bd^2}$, will be for concrete 9.5, and for York paving 124.7, being about in the proportion of 1 to 13.

The experiments I have had the opportunity of witnessing, and which offer by far the most instructive results, have been the practical application of concrete to the construction of river-walls at Woolwich and Chatham; in both these instances M. Ranger's patent concrete has been used. In one instance, at Woolwich, it has been applied in mass, the wall having been constructed in the same manner as the Brighton sea-wall, described by Colonel Reid in vol. i.: in both the other instances, at Woolwich and Chatham, the concrete was formed into blocks, which were allowed ample time to set and harden before they were built into the face of the wall.

At Woolwich the riverwall is for the most part founded upon piles; its height above the piles is about 24 feet, the thickness at bottom 9 feet, at top 5 feet, with a slope or batter in front of 3 feet in 22: the face of this wall is composed of the abovementioned blocks, which are laid in cement, in courses 1 ft. 6 in height, the headers and stretchers in the course being each 2 ft. 6 long, the former having a bed of 2 feet, while the latter have only 1 foot; behind the facing the rough concrete is thrown in to complete the thickness of the wall and counter-forts. Both the blocks and the rough concrete are composed of lime and gravel, in the proportion of 1 to 7, and brought to the proper consistence with boiling water; but the blocks are, or ought to be, made with Aberthaw lime, while Dorking lime is used for the rest of the work. The blocks are cast in moulds, and are submitted to pressure while setting: a coating of finer stuff is given to the face for the sake of appearance. The whole of the wall is built by tide work, and in the lower part therefore the backing of rough concrete has hardly time to set before it is covered by the tide; the water, however, in this instance, appears to affect the surface of the mass only, the interior, at the depth of a few inches, being, generally speaking, dry, and of a moderate degree of hardness when examined after the retirement of the tide.

During the summer the action of the water from day to day upon the facing of the river-wall wast not perceptible; the surface still remained moderately hard; occasionally portions of the fine facing separated from the rest of the block, owing, it was said, sometimes to want of care in the original construction, sometimes to injuries caused by boats or vessels striking the wall: in these cases, however, a new facing of cement was applied, and before the winter the general appearance of the wall was to a certain extent satisfactory.

During the hard frost, however, evidences of failure began to show themselves; and as soon as the thaw allowed a thorough inspection of the face of the wall to be made, it was found that hardly a single block had escaped without some damage; in many instances the whole face had peeled off to the depth of half an inch; and at one spot, where a drain discharged itself into the river from a height of about six or eight feet, the back action of the water after its fall had worn away the lower courses to the depth of some inches: these were the evidences of the action of frost and water combined upon the best constructed wall at Woolwich. At Chatham they were of the same character, but the damage done to the wall was much greater.

The portion of river-wall at Woolwich, which was built with rough concrete, had been severely injured by the common action of the water before the frost; and the latter has only caused the destruction of the face to proceed with greater rapidity. Since the frost I have examined the walls of a school near Blackheath, which was built with concrete some years ago: I found that at the ground line, where the drip of the water had acted, the concrete was soft, and yielded easily to any force applied, while the walls above were very fairly hard, and seemed to have stood very well.

These then are the facts I have to lay before my brother officers; and I think they afford sufficient grounds for asserting, that in climates like ours, in situations exposed to the alternate action of water and air, concrete cannot be advantageously used as a building material, the apparent economy, caused by the cheapness of the material employed, being more than compensated for by the frequency of repairs. From the circumstance that at Chatham some of the blocks remain to a certain extent uninjured, whilst others close to them, and exposed to exactly the same action, are completely decomposed, one would be tempted to infer, that proper caution had not been used in the selection of the lime of which the latter were composed; and that, had Aberthaw lime been used throughout, the damage would not have been near so great; but even in this case, although the frost might not have produced so much effect upon the work, and should concrete be considered perfectly impervious to chemical action, yet the want of tenacity, or of power to resist a very trifling force, renders it peculiarly inapplicable to situations where, as in wharf-walls, it will be exposed to damage from the collision of vessels and floating bodies, in addition to the constant mechanical action of the water; where, however, it is protected from these causes of destruction, as in foundations, its value is unquestionable; and even in the backing of retaining-walls, revetements, &c., it may in many cases be advantageously applied, taking care to allow it time to set before any great pressure is thrown upon the wall. The specific gravity of concrete is from 120 to 130, about the same as that of brick-work.

APPLICATION OF PRICE AND MANBY'S HOT WATER APPARATUS TO DRYING OF TIMBER.

A stove has been constructed for Messrs. S. and J. Holme, very extensive builders at Liverpool, for the purpose of drying timber for floors, and other fittings of houses, &c., by the application of Messrs. Price and Manby's patent warming apparatus, as described in our Journal, No. 10, page 237.* which, with the great number of hands they employ, was a serious inconvenience and loss; they are now fully prepared at all times with a stock of timber perfectly dried, as if by the combined action of sun and wind; and they find the timber is seasoned in a manner much superior to any other method. The dimensions of the stove, in which the timber is dried, are 43 feet long, 11 feet wide, 17 feet 6 inches high; and the cost of the apparatus was about 150l.

An experiment was tried by having a flooring batten, 7 inches × 1¼ inches cut from a piece of timber which had been floated and was as full of water as it could be placed in the stove, and when the temperature was 102° it remained there five days, and when sawed down into ⅝ broad and planed it was found to be perfectly dried throughout. The heat is so gentle and the evaporation so equal, that the timber is never rent, as when exposed to the air and a hot sun; in short, it certainly is the most perfect timber-stove that has been made. It would be invaluable for large cabinet makers, pattern makers, and piano-forte manufacturers.

Annexed is a letter from Messrs. S. and J. Holmes, of Liverpool, relative to the merits of the stove:—

"September 26, 1838.

"Gentlemen,—We have delayed writing until now, that we might give our drying stove a fair trial before we expressed any opinion upon its merits. It has now been filled and emptied three times, and it has certainly exceeded our expectations. The stove holds about 30,000 superficial feet of inch boards, and upon our late system (steam pipes) occupied us nearly a *month* in drying. Your apparatus, with rather less fuel, has thoroughly, dried each stove-full in ten days; thus sparing us considerableextra labour enabling us to expedite our business, and saving us the consumption of twenty days' fuel. The average temperature is 104°; and as the continuous stream of pure air, passing between the metallic plates, is divested of its moisture, it carries off the dampness from the timber in an imperceptible but most effectual manner. We find it a very great convenience, from the superior way in which the timber is dried, and because it will not be liable to shrink in the least. We are satisfied that the apparatus would be invaluable for many purposes in our national manufactures, as it combines efficacy with simplicity. Our yardman and night watchman attend to it successively, and it seems impossible that it can get out of order.

"We are, gentlemen, yours, very faithfully,

(Signed) "SAMUEL and JAMES HOLME."

"To Messrs. Price and Manby, London."

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* In their large undertakings, Messrs. Holmes found a difficulty in keeping a stock of dry timber.

MONTROSE SUSPENSION BRIDGE.

The suspension-bridge of Montrose has, by the awful storm on Thursday, 4th ult., been rendered impassable. Exposed as it was to the whole force of the hurricane, and from its great length, a very considerable vibration was experienced on the bridge during the afternoon and evening; and at twenty minutes before seven, a large portion of the platform, or roadway, started and sunk, with a report resembling that of distant thunder. Portions of the wooden material of the bridge have been washed on to Rossie Island. It is ascertained that no person passed through the toll on the south end immediately previous to the accident, and we fervently trust there had been none from the north. The mail from Aberdeen, which arrived in rather less than an hour after it was due, was detained in town during the night. Sorely tried as the chains of the bridge must have been, they have stood firm, and do not appear to have sustained the slightest injury.

The appearance of the bridge on Friday morning after the accident proved that we had underrated the extent and nature of the catastrophe. The structure, as most of our readers know, is suspended by four main chains, which were recently strengthened by additional links, and rest on massive stone towers, 72 feet high, 39½ wide, and 20 feet in thickness at the level of the roadway, and at the top 32 by 12. The distance betwixt the suspension towers is 432 feet; and the bridge thus presented one vast and beautiful span, over a deep and rapid river, unequalled in extent by any similar erection in Britain, excepting the Menai Bridge. The entrance to the bridge at either side is by an archway in each tower, 18 feet high by 16 feet wide. The platform, or roadway, was laid upon cast iron beams, suspended from the main chains by perpendicular iron bars or tension rods, about five feet apart. On the occasion of a westerly gale, the bridge has been frequently observed in a kind of undulatory motion: but on Thursday afternoon, about dusk, it rocked like a vessel tossed by an angry surge, and at the height of the storm the platform separated nearly at the centre, and, to the extent of about 130 feet, was almost instantaneously torn up by the violence of the hurricane, and disappeared in the highly agitated waters below. The main chains, indeed, had stood firm; but almost all the tension rods were twisted and bent from their position, and many broken; and, independent of the large portion of it carried away, the platform had, by the extraordinary vibration of the bridge, been detached six or seven inches from the stone work at each end. Portions of the wrecked roadway were on Friday morning still suspended by the chains, and hung downwards to the river; while the remaining parts are bent and inclined seemingly according to the pleasure of the rods. The dreary aspect of this magnificent work gave silent but powerful admonition of the ease with which the strongest and most beautiful works of man can be riven and shattered and trampled beneath the power of the elements, when their strength is put forth in wrath. Temporary accommodation for the mail and other coach horses has been provided on Rossie Island; while the passengers, &c., are conveyed by ferry-boats; but it is believed that a road for pedestrians may speedily be constructed over the breech in the bridge without much difficulty.—*Montrose Review.*

NEW WATER COCKS, HIGH PRESSURE STEAM AND OTHER COCKS.

Fig. 1. Elevation.

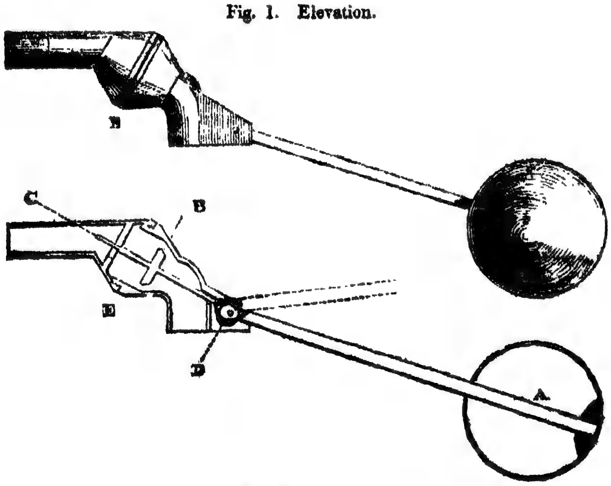


Fig. 2. Section.

Mr. Henry R. Abraham, of Torrington-street, Russell-square, has patented certain inventions by which adhesion, leakage, and difficulty of action in cocks, is overcome; and, as they are novel in their form and action, a description of them may be acceptable to those interested in this important branch of fluid apparatus.

The first that comes under notice is the service or ball-cock for cisterns and of this we annex an engraving, reserving for a future number the description of the other and equally important contrivances.

A new ball-cock has long been a desideratum, for certainly no article in common use, with so many defects, has met with an equal share of toleration. For this we have been indebted to those who find half-a-crown for occasionally *oiling* and *easing* a fruitful source of profit, and the occasion of many another little snug emolument, such as the detection of faults in cisterns, which otherwise might have remained for ever undetected, and the new leathering of valves which, had not the ball-cock been "seen to," might have remained unmolested for ages. In fact, the ball-cock is the plumber's best friend; and no improvement will ever supersede it, unless the architect and builder become parties to its banishment.

That which is required in a ball-cock is certainty of action, rapidity of delivery, simplicity of parts, and durability of construction. Of these requisites not one is possessed by the common ball-cock.

Figure 1 is an elevation, and figure 2 a section of Mr. Abraham's apparatus. Figure 2 is a small ball, sufficiently buoyant to float the power necessary to throw back the valve B, when the service of water is on at the highest possible pressure. The valve is here shown open, or thrown back by the depression of the ball, and in this situation it is held so long as the spindle C infringes upon the eccentric D. The ball, floating, slowly relieves the spindle, and allows the pressure of water flowing in to close the valve, the greater the pressure the greater being the security, while the smallest possible head of water suffices to stop the supply. From the cut, it is obvious that no action occurs until the float reaches above the line of the cock. Thus the cistern is filled with a stream equal to the whole capacity of the pipe to the very brim. In this manner the greatest possible rapidity of supply is obtained. The other qualities are also obtained, as from the construction no sticking can occur, there being no extent of surface in contact. In the event of any obstruction occurring from dirt or weeds, a casualty not probable, by unscrewing the parts at E, the most uninitiated may remove the defect. Of its simplicity there can be no question. A great advantage of such an apparatus as the one before us is, that in using it much smaller pipes will suffice than those usually employed, and a great saving as well as greater neatness of execution be effected. For instance, a half-inch service pipe will fill a cistern in one-third the time now taken by the three-quarter cock and three-quarter service; and if there be 20 feet of pipe from the main, the difference in expense, with joints included, will amount to more than the price of the article, and a large sum is saved in the greater capacity of the cistern. Why plumbers now fix three-quarter service pipes to cocks which only deliver about a fifth of the quantity that a three-quarter pipe will supply, is a trade secret; and why cock-founders make the cocks with three different capacities of orifice, the middle one discharging about a fourth the quantity of the bore, is another secret. But architects and engineers allow it, and the best cock-founder is he who can work the most lead in his metal, substitute most grease for grinding, and charge less per dozen than other houses in the trade. The profit to the plumber is largest on the worst article. Thus the trade price of a three-quarter ball-cock is 30s. per dozen; copper balls, 1s. 8d. each; boss, 6d.; cement, solder, and labour for joints, 1s. 2d.; so that the whole, fixed, costs six shillings, while the price charged by the plumber is seldom less than 16 shillings.

We do not intend to stigmatise the trade in general by these remarks. There are many honourable men who spare no cost on their work, and obtain too often no better favour than the scamp who fixes the worst apparatus, and claims the highest reward.

TUNNEL UNDER THE THAMES AT GRAVESEND.

An Act of Parliament was obtained in 1799, containing 65 clauses, to authorise the construction of a Tunnel under the Thames from Gravesend to near Tilbury Fort.

Capital 30,000*l.*, in 100*l.* shares, with permission to raise 20,000*l.* more, if required. No tolls were to be taken from the military on march, or for military stores, for which exemption the Government was to pay to the company the sum of 1,000*l.* per annum. The company to pay to his Majesty the sum of 80*l.* per annum, for compensation for injury done to the ferry, which is the property of the Crown, and a like rent of 30*l.* to the corporation of Gravesend, for injury done to their portion of the ferry.

Mr. R. Dodd was the projector. His tunnel was to be 16 feet diameter in the clear, and was to be illuminated with lamps (gas not being then known). His estimate was as follows:—

900 yards of running measure of tunnelling, digging, and vaulting, with key stones, at 12*l.* per yard	£10,800
Relaying the bottom with new-made ground, 900 yards, at 1*l.*	900
Fixing lamps and irons through the tunnel, toll collector's room, gates, &c.	400
Making good entrance roads at each end	160
Steam engine and pipes, if necessary	1,780
Necessary machinery during the execution	500
Ten per cent. on the whole for contingencies	1,455
Total	£15,995

The work was estimated to be finished in 12 months.—I believe the work was begun and carried on, although slowly, for upwards of three years.

S.

The late great Fire at Liverpool.—From the official report of the fire-offices relative to the extent of the insurance on the property destroyed at the late calamitous fire at Liverpool, it appears that nearly the whole is covered by the following amount of insurances:—Liverpool Fire Insurance-office, 24,000*l.*; Royal Exchange, 22,000*l.*; Sun, 19,000*l.*; Manchester, 14,000*l.*; West of England, 13,000*l.*; Phœnix, 7,000*l.*; London, 6,000*l.*; York and North of England, 5,000*l.*; Guardian, 4,000*l.*; Scottish, 3,000*l.*; Yorkshire, 500*l.*; Alliance, 2,000*l.*—Total, 119,500*l.* The extent of the loss was estimated at 120,000*l.*—*Evening paper.*

DIMENSIONS OF SUSPENSION FOOT BRIDGE OVER THE RIVER THAMES,

FROM HUNGERFORD MARKET TO BELVIDERE ROAD LAMBETH, AT THE PART AT PRESENT KNOWN AS "SMITH'S WHARF," NEAR THE CORNER OF SUTTON STREET. ENGINEER, I. K. BRUNEL, ESQ. CONTRACTORS, MESSRS. GRISSELL AND PETO, LAMBETH.

	Feet	In.
Length in clear of the Land Piers	1400	0
Width of Roadway	14	0
Span of Centre opening, from centre to centre of Piers	600	0
Versed sine of do.	50	0
Width of two Water Piers, each	19	0
Span of side opening, from centre of Piers to Abutment	400	0
Height of Roadway above high water mark	29	3
Height of Suspension Piers above Roadway	62	9
Total length of Chain, from extremity of Land Tie on North side, to extremity of Land Tie on South side	1600	0
Average length of Links, from centre to centre 24 to	25	0
From high water mark to seating of Chains on Piers	82	0
Radius of curve nearly corresponding to the curve of the Chains	925	0
Difference of Level between the points of support	53	0
Length of Land Tie (North side)	70	0
Length of Land Tie (South side)	105	0
Rise of Floor from abutments to centre	8	6

Total number of Links for Chains . 1680

500 $1\frac{7}{8}$ inches thick		for the lower part
500 $1\frac{7}{16}$	"	
340 1	"	for the extremities.
350 $1\frac{3}{16}$	"	

All the Links to prove to 10 tons on the inch.
Suspending Rods, $1\frac{3}{8}$ in diameter.
Amount of contract, about £85,000.

CYCLORAMA.

A most extraordinary exhibition, under the above title, is about to be opened by subscription. It will consist of a revolving picture, 120 feet in diameter and 40 feet high, upon the principle of the Diorama. The artist is the Chevalier Bouton, who has been so successful at the Diorama. The machinery is to be constructed under the superintendence of Mr. Bradwell, of Covent Garden Theatre.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL GEOLOGICAL SOCIETY OF CORNWALL.

The twenty-fifth annual meeting of this society was held on Tuesday last at Penzance, the President, Davies Gilbert, Esq., D.C.L., V.P.R.S., in the chair.

TWENTY-FIFTH ANNUAL REPORT OF THE COUNCIL.

On presenting their twenty-fifth Annual Report, the Council have to communicate the gratifying information that her Majesty the Queen was pleased to receive the address of congratulation and condolence from the Society in the most gracious manner, and to signify her intention to comply with the wishes of the Society, by becoming its Patroness.

The Map (of what may, perhaps, not improperly be termed the surface Geology) of Cornwall, executed by Mr. De la Beche, and the illustrative Memoir by which it is to be accompanied—anticipated in the last Report—have not yet appeared.

Unforeseen circumstances, chiefly on the part of the printer, have delayed the appearance of the fifth volume of the Society's Transactions; but a considerable portion of it, embracing a large part of Mr. Henwood's Memoir on the Mines of the County, on which he has been more or less occupied for twelve years past, is now on the table; and the surveys being all completed, it will be published in the early part of the ensuing year.

Dr. Boase has been compelled to delay his Memoir on the diluvium and other transported matter of Cornwall: but it is only deferred, not withdrawn, and will occupy a prominent place in the next volume of Transactions.

The donations to the Museum and Library, during the past year, have not been very numerous, but in value they have not been often exceeded.

The Council also notice with peculiar satisfaction the interest shown in the advancement of the Society by the practical miners of the county.

The establishment of an Academy for instruction in the Arts and Sciences connected with the mining in Cornwall, has been a long cherished object of the Society; but it is obvious that such an institution is not likely to be formed, until the mining interest in general shall be convinced of its utility and nesessity, and shall express their opinion in its favour. The council rejoice in the belief that this conviction is increasing; and that it will not be long before, either by the establishment of a kind of experimental college, or by the periodical visits of the principal professors of the arts and sciences connected with mining, the reproach which has been long and deservedly applied to Cornwall, or rather to England—that, with the richest and most instructive mining field in Europe, it is behind almost every other nation in furnishing scientific information to its mining population in general, as in providing the means of leading those on whom the management of the mines principally depends, into the higher parts of the sciences which bear upon the theory and practice of mining—will be entirely wiped away.

During the meeting of the British Association at Newcastle, a committee was appointed for the purpose of assisting different mining districts in an united effort to originate a school for instruction in the arts and sciences, connected with mining, on an enlarged scale; and the Council embrace the present opportunity of calling on the members, and all who are connected with the mining interests of this country, and the interests of science generally, to use their best exertions to promote so important an object.

Among the papers which had been read since the last report were the following:—

Notice of a raised Beach immediately under a part of the town of Penzance. By Joseph Carne, Esq., F.R.S., &c.

On the Assaying of Copper Ores by means of Galvanism. By Martin J. Roberts, Esq.

On the expansive Action of Steam in the Cylinders of the Cornish Pumping Engines. By W. J. Henwood, F.G.S.

ROYAL CORNWALL POLYTECHNIC SOCIETY.

The anniversary of this institution was celebrated in their hall at Falmouth, on the 2nd, 3rd, and 4th instant, and surpassed all its predecessors both in numbers of attendants and in the importance of its objects. This institution is formed on the basis of the Society of Arts in the Adelphi, and distributes annual premiums for simi'ar objects. One great feature of it, and one deserving of attention, is the very great share that ladies are allowed to take in its proceedings, and, it appears, with complete success. In the departments of the Fine Arts, the ladies carried off a great many prizes, and some in departments which they do not generally cultivate.

After an address from the chairman, the venerable Davies Gilbert, the several premiums were distributed to the successful competitors.

A premium of ten guineas, by Sir Charles Leman, Bart., and R. W. Fox, Esq.; for the best reports of a series of experiments made with the wedge for blasting rocks, invented by R. W. Fox, Esq.; awarded to Captain Richard Dunstan, of Wheal Vyvyan mine.

A premium of ten guineas, by G. C. Fox, Esq., for the best essay on the various diseases incidental to miners, their cause, and the best practical means of remedying them—any statistical information as to their longevity, compared with that of the other population of the county, is deemed highly desirable; awarded, in terms of high commendation, to Richard Lanyon, Esq., of Camborne.

A premium of ten pounds, by John Hearle Tremayne, Esq., for the best available method or improvement on the plans already suggested for facilitating the ascent and descent of miners; awarded to John Phillips, of Halsetown—on account, however, of its merits underground—the judges not being prepared to recommend in equal terms the machinery to be employed above.

Several other premiums for models were then distributed, and others announced for competition in the ensuing year. Among these was one by Charles Fox, Esq., for such instructions for a general and particular examination of every steam-boat engineer as may place beyond a doubt the candidate's capability to undertake a charge of such great importance, either in long or short voyages, in fine or stormy weather, and when the boilers and machinery are in order, or when some parts have received injuries not irremediable at sea, or at least not incompatible with the use of steam during the remainder of the voyage. The competitors for this premium must forward their papers free of expense to the Secretaries within nine months from this time. The general committee will have the power to award the premiums at that time, and will be at liberty to prepare a compilation from the papers successfully competing. The most concise examination, in which nothing of real importance shall be omitted, will be preferred.—£7 7s., £5 5s., £3 3s., and £2 2s.

A premium to the amount of £350, was offered by Charles Fox, Esq., and other gentlemen, to the first mine which should adopt the principles of any of the Society's machines for raising the miners from their work.

After some other incidental business, the President observed that five or six other societies had been formed upon the model of this. He believed he need not inform the meeting that this society owed its origin to two young ladies, at that time not twenty years of age, supported indeed by the judgment and liberality of their relations, who were well known to all present, and whose reputation extended from one end of Europe to the other.

The Secretary then read a letter from a working miner to J. S. Enys, Esq., on a mode of extracting copper from mingled copper and tin ore by the aid of sand; after which

R. W. Fox, Esq., made some remarks on the ascent and descent of miners at King William mine, in the Hartz, by machinery similar to that which had on that day received their award. So highly was it appreciated by the workmen, that men employed forty fathoms above it, and at three quarters of a mile distance, preferred coming to it, to ascending by ladders from the spot where they were working. He then gave a short but very interesting lecture, as we may well term it, on the formation of mineral veins by electricity, in illustration of which he exhibited the result of various experiments.

On Wednesday the 3rd, the hall was opened for the exhibitions, and the minor prizes were distributed. Among these were a safety apparatus for a steam-boiler, by S. Hocking; copper-house, Hayle; model of Penzance Market House, &c. The ladies carried off prizes for amateur oil painting; drawings in water colours; pencil, crayons, and pen and ink, engraving, and etching; architectural drawings, &c. They also gained prizes for an herbarium of foreign plants, and a collection of lichens.

INSTITUTION OF CIVIL ENGINEERS.

Report of Papers read and Proceedings, Session 1838.

(Continued from page 348.)

Explosion of Steam Boilers.

Mr. Lowe stated that the ordinary process of making water gas showed that an iron plate would readily decompose steam or water. The decomposition of water goes on extremely well until the oxidation of the tube has advanced to at least $\frac{1}{16}$ths of an inch. An iron tube begins to make gas extremely fast at first, and continues until the tube is cased with a thick crust of protoxide of iron.

Improved Levelling Staff.

Mr. Bruff exhibited an improved form of Levelling Staff. The figures on this staff are inverted, so that when viewed by an inverting telescope in the usual manner, they appear erect, and are read off without any danger of mis-mistake; which may readily occur when some figures, as, for instance, 6 and 9, are read off inverted. The mechanical arrangements for extending it are with the view of securing greater steadiness. The principal improvement consists in there being attached to the bottom an universal joint, fixed to an iron plate; this plate remaining fixed, the necessary errors consequent on moving the staff for reversing its face, when the last forward station is to become the next back, are avoided.

It was suggested that the universal joint would be attended with great advantages in sloping ground; in general, however, the tripod invented by Mr. Simms was sufficiently convenient.

Mr. Bald suggested that the universal joint would be extremely serviceable if placed on something solid. It was his practice to drive a wooden plug into the ground, on which the staff was set; these plugs were left in, and serviceable for verifying the observations. He had levelled through a distance of forty miles, leaving a plug at every station.

Experiments on the Flow of Water through pipes of different lengths. By W. A. Provis, M. Inst. C.E.

In this paper are recorded *two hundred and eight* experiments on the flow of water through leaden pipes of $1\frac{1}{2}$ inch diameter, of lengths 100, 80, 60, and 40 feet, and for heads of water of 35, 30, 24, 18, 12, and 6 inches. The arrangement of the experiments is described with great accuracy, and the results of the experiments are given in twelve tables, showing the length and inclination of the pipe, the head of water at the upper end of the pipe, the time from turning the water into the upper end of the pipe to its reaching the lower end, the time of filling the receiver, the discharge in cubic feet per minute, and the mean discharge per minute. To each set of experiments is appended a column of remarks, in which the state of the pipe as to dryness, and the quantity of water in the discharging end, are recorded; these circumstances having considerable influence on the quantity of the discharge.

The experiments are tabulated in a different form, showing the effect of a given head of water in pipes of different lengths and inclinations. The following important results are deduced. In level pipes the quantity of water discharged is nearly in the inverse ratio of the square root of the length; but the departure from this rule is greatest in the shortest lengths and greatest heads. In inclined pipes, the increased discharge is greater in the long than in the short pipes. The increased discharge for an increased head is nearly in the same proportion through the long and short lengths.

Table of Gradients. By C. Bourns, A. Inst. C. E.

per mile.				per chain.		per mile.				per chain.	
1 ft.	=	1 in 5280	=	.15	of an in.	31 ft.	=	1 in 170.3	=	4.65	of an in.
2	=	" 2640	=	.30	"	32	=	" 165.0	=	4.80	"
3	=	" 1760	=	.45	"	33	=	" 160.0	=	4.95	"
4	=	" 1320	=	.60	"	34	=	" 155.3	=	5.10	"
5	=	" 1056	=	.75	"	35	=	" 150.8	=	5.25	"
6	=	" 880	=	.90	"	36	=	" 146.6	=	5.40	"
7	=	" 754.2	=	1.05	"	37	=	" 142.7	=	5.55	"
8	=	" 660.0	=	1.20	"	38	=	" 138.9	=	5.70	"
9	=	" 586.6	=	1.35	"	39	=	" 135.1	=	5.85	"
10	=	" 528.0	=	1.50	"	40	=	" 132.0	=	6.00	"
11	=	" 480.0	=	1.65	"	41	=	" 128.8	=	6.15	"
12	=	" 440.0	=	1.80	"	42	=	" 125.7	=	6.30	"
13	=	" 406.1	=	1.95	"	43	=	" 122.8	=	6.45	"
14	=	" 377.1	=	2.10	"	44	=	" 120.0	=	6.60	"
15	=	" 352.0	=	2.25	"	45	=	" 117.3	=	6.75	"
16	=	" 330.0	=	2.40	"	46	=	" 114.8	=	6.90	"
17	=	" 310.6	=	2.55	"	47	=	" 112.3	=	7.05	"
18	=	" 293.3	=	2.70	"	48	=	" 110.0	=	7.20	"
19	=	" 277.9	=	2.85	"	49	=	" 107.7	=	7.35	"
20	=	" 264.0	=	3.00	"	50	=	" 105.6	=	7.50	"
21	=	" 251.4	=	3.15	"	51	=	" 103.5	=	7.65	"
22	=	" 240.0	=	3.30	"	52	=	" 101.5	=	7.80	"
23	=	" 229.5	=	3.45	"	53	=	" 99.6	=	7.95	"
24	=	" 220.0	=	3.60	"	54	=	" 97.8	=	8.10	"
25	=	" 211.2	=	3.75	"	55	=	" 96.0	=	8.25	"
26	=	" 203.1	=	3.90	"	56	=	" 94.3	=	8.40	"
27	=	" 195.5	=	4.05	"	57	=	" 92.6	=	8.55	"
28	=	" 188.6	=	4.20	"	58	=	" 91.0	=	8.70	"
29	=	[illegible] 182.1	=	4.35	"	59	=	" 89.5	=	8.85	"
30	=	[illegible] 176.0	=	4.50	"	60	=	" 88.0	=	9.00	"

Description and Drawing of the Ice Boat. By S. Ballard, A. Inst. C.E.

The principle of breaking ice adopted by Mr. Ballard, as explained in a communicaiton made last session,* consists in forcing the ice upwards instead of forcing through it horizontally, or by pressing it down. For this purpose a frame, coated with sheet iron, is laid over the front of a boat, with an inclination downward from the boat, the lower end being under the ice. The paper describes the construction of the boat by reference to a detailed drawing and section.

On the Construction of Roads on Deep Bogs and Moss. By W. Bald.

In this paper the author gives a detailed account of the construction of roads through bogs, and of the methods of securing the foundations of small bridges in boggy places; also some suggestions on the formation of railways on deep moss.

The general principles are as follow:—The first operation after laying out the line of road is to drain thoroughly the bog over which it is to pass. For this purpose main drains and counter drains parallel to the line of road are to be cut with a regular discharging fall along the bottom. Transverse drains must also be cut betwixt the main and the counter drains, so as effectually to drain off all the surface water and stagnant pools. The cutting of these drains must be carried on gradually, and by degrees; if the bog be moist, the operations, which can only be carried on at dry seasons of the year, will probably have to be continued over three or four years before the drains become permanently fixed at the required dimensions. The counter drains are essential, as they relieve the pressure on the sides of the main drain, and consequently prevent it filling up. The bog stuff cut out is to be dried, and when the bog under the line of road has become sufficiently dry, the road is to be levelled, and made of proper shape, and the cross drains are to be filled with dry turf.

The road-way is then to be floored or trunked over with five courses of dry heathy sods, which are to be well rolled with a heavy cylinder. Upon this trunking is to be laid a soling, consisting of a mixed mass of prepared earth and gravel, of about six inches in thickness, and the whole to be coated with good clean gravel. The road metal is then to be laid on, in two successive coats, each of about three inches in thickness, the first being well consolidated before the second is laid on.

The great points to be aimed at are perfect drainage and good trunking, as, if these are not attained, roads constructed on bog will lose their shape, become ruinous, and soon go to decay.

The author considers the form and size of hammers employed in breaking hard stones.

These are frequently too heavy; a hammer weighing about a pound and a quarter, of an elliptical form, pointed at the ends, the area of end being about $\frac{1}{16}$th part of a square inch, appears to be best suited for ordinary purposes.

The turf of bog, being carbonized, makes excellent fuel, and may be employed in the manufacture of iron, and such iron is extremely malleable. Turf fuel is also used most extensively in working the steam engine in many districts of Ireland; it is used on board the Dunally steam boat, for engines of eighteen horse power, and the expense is fourpence per mile.

A communication was read from Mr. Buck on the relation betwixt the diameter and intermediate spaces of the tubes in a locomotive boiler, for the production of an maximum effect in the generation of steam.

[*End of the proceedings, Session* 1838.]

ACADEMY OF THE ANTIQUE,

73, Margaret-street, Cavendish-square.

This institution has been formed by Mr. Fletcher and Mr. Loft, both artists of considerable reputation, to supply that deficiency which exists of a gallery for the study of the antique. It consists of a figure academy, and ladies' academy, to which is proposed to be added, a life academy, while the scale of charges is so moderate as to be considered too low. The figure academy now in operation is established in a lofty and spacious apartment, with walls of a good ground, something of a salmon colour, and most effectively and brilliantly lighted by a chandelier, with a reflector and eight large gas burners. In this academy are arranged numerous figures from the antiques, among which we observed the Apollo, Venus, Fighting Gladiator, Boxers, Antinous, Genio del Riposo, Germanicus, Genius of the Vatican, &c. There is also accommodation for anatomical lectures. The studies are proposed to be principally devoted to the antique, but good modern works are not intended to be excluded; indeed we noticed a rare work by Michael Angelo, a head of Brutus, which excited in the strongest terms the admiration of Sir David Wilkie. The instruction is under the direction of Mr. Villalobos, who has studied extensively in the academies abroad, and we feel happy to bear testimony that the system on which he proceeds, as it is that adopted in our most enlightened schools and on the continent, admits of no doubt as to its success and efficiency. Among the pupils, and it is there that you must look for the proper estimation in which a master is to be held, we observed some elderly artists, others younger, and several amateurs, including one or two civil engineers.

This institution has met with the approbation of all who have visited it, including some of the first artists and connoisseurs of the day, and justly, on account of the unequalled facilities which it affords; and we recommend our readers to go and visit an institution where the courtesy of its directors will make them welcome. The figures are supplied as they are wanted from the gallery of Messrs. Loft (late Sarti), Dean-street, Soho, modellers to the Government, where they have also a school, who have the most extensive collection of casts in this

* See "Minutes of Proceedings," Jan. 31, 1837.—Journal, No. 2, page 26.

country, including most of the antique and modern figures, the Elgin, and the British Museum. Thus the student has access to treasures which are not possessed by any other institution except the Royal Academy, and there, on account of the want of accommodation, the casts are not all available, while the professional nature of the institution precludes its being accessible to the public. In the Margaret-street school, however, the amateur, as well as the artist, can have access to works no where else to be found, and we can confidently assert that it will not only prove a most valuable auxiliary to the Royal Academy, but that it must already take rank before any of the provincial schools of drawing, whether at Dublin, Edinburgh, or elsewhere, and even before most on the continent.

We fully concur in the high opinions which have been expressed of its merits, and we trust that the success which cannot fail to attend it, from its treasures of art and excellent lighting and accommodation, may be such as to enable its public-spirited promoters to persevere until they succeed in establishing what is so much wanted, an accessible school for studying the antique, the living, and the dissected figure.

LAW PROCEEDINGS.

RATING OF RAILWAYS FOR PARISH RATES.

On Wednesday, the 17th October, an adjourned Petty Sessions was holden at Wandsworth, before the magistrates, J. Notridge, Esq., in the chair, for the hearing of appeals against the new assessment for the relief of the poor in the parish of Battersea.

The rating has just been completed, under a survey and valuation made by Mr. Lee on the part of the overseers, and the appeals against it appeared to be numerous,—they were stated to us to be as many as 40. The most important was the case of the Southampton Railway terminus, which is at the extremity of this parish. The rate was as follows:—

Terminus and depôt.—Extent, seven acres.; gross rent, 2,700*l.*; rateable value, 2,000*l.* per annum.

Against this rating the directors of the railway gave notice of appeal on general grounds.

Mr. Bircham, the solicitor of the company, appeared for the appellants; and Mr. Field on the part of the parish.

After a few general remarks upon the law of the case, Mr. Bircham called the architect of the company, Mr. Tite, who stated, that he had surveyed and valued the premises; and that, in his judgment, the annual gross rent was 1,445*l.*, and the rateable value 1,218*l.*; that this was a fair assessment under all the circumstances; and a fair interpretation of the law, so far as he could understand it, as it could be made to apply to this case; but that if the mere dry value of the rent of the land and buildings was to be sought for, from an accidental taker for some general business, as that of a brewer, distiller, dyer, or any similar trade, it was not probable that even 500*l.* per annum could be obtained.

On cross-examination Mr. Tite stated, that, as architect, he had only erected the main building, containing the offices, waiting-rooms for passengers, board, secretary, and engineer; and that of them he knew the cost; but that the great arrival shed, smithery, coach-houses, and locomotive-engine sheds, were constructed under the direction of the engineer, Mr. Locke, by workmen employed by the company upon their general works upon the line, and that the cost could not be separated; but that, in his opinion, all the buildings together, including the boundary walls, could have been erected for, and did not cost more, than 27,750*l.*; and that this did not include tenants' fixtures, nor rails, nor machinery. On which point it was admitted by Mr. Field, that tenants' fixtures were not rated in the parish; though in some cases, as in the instance of a mill, machinery was assessed.

The witness further stated, in explanation of the principles of his valuation, that in other appeals and assessments for tithes and rates upon large public buildings in which he had been concerned, or with which he was acquainted, and when the market value to let could not be ascertained, it had been proposed to take a per centage on the cost of the buildings, which, added to the value of the land, might be assumed as a fair assessment of annual value. That for the reasons that public buildings for public purposes were necessarily more ornamental in their character, and larger in their dimensions, than private ones, and that as a good deal of the outlay, in this particular instance, had been made for the mere convenience of the public, beyond the necessities of the case, 4 per cent. upon this amount had been considered a fair and just rate of charge; and that this per centage, added to the value of the land, had been assumed as a gross rent, and proposed as the basis of the rateable value. That, pursuing this principle, 4 per cent. on the 27,750*l.* would give an amount of 1,110*l.* per annum, to which, by adding 25*l.* for an old stable building (making a total of 1,135*l.*), and deducting 20 per cent. for the outgoings, as directed by the Act of Parliament (viz. repairs, insurance, land tax, and other landlord's liabilities), a net rent of 908*l.* would be obtained. Thus, by assuming the value of the seven acres of land at 30*l.* per acre as a building land, and an additional value of 100*l.* per annum for a water frontage to the wharf, a total of 1,218*l.* would be obtained, as previously stated.

This witness was cross-examined at great length, but nothing appeared to call in question the facts or reasonings deposed to by him. He admitted that the profit expected by a builder on buildings erected for others was 5 per cent. on the outlay; but explained that this could not be assumed as the rateable value, because the value of any house or premises to let might be greatly increased or diminished by other circumstances.

Mr. James White Higgins, Surveyor to the Commissioners of Woods and Forests, and Mr. D. R. Roper, confirmed the testimony of the previous witness, Mr. Tite; and Mr. Higgins stated, that he had been concerned with that gentleman and Mr. Hardwick in the appeal of the Birmingham Railway Company against the rating of the parish of St. Pancras, when the rate of 10,000*l.* had been reduced to 7,300*l.*, in a much lower rate of interest than 4 per cent. on the building, because of the highly ornamental character of the buildings, the portico alone having cost 40,000*l.*

In reply, after some able remarks, Mr. Field called Mr. Lee, who stated, that in his valuation for the parish he took the outlay at 30,000*l.*; which, at 6 per cent., gave 1,800*l.* as the rent of the buildings; that to this he added 500*l.* for the land, which he valued as building land at 40*l.* per acre, and added 220*l.* for the river frontage, being at the rate of 35s. per foot; that to this he added, agreeably to the circular of the Poor Law Commissioners, 400*l.* for the tenants' rates—which, in Battersea, amounted to 4s. 6d. in the 1*l.*—making a total of 2,700*l.* as the gross rent. From this, for the net rent, he deducted the 400*l.* back again; and an additional 300*l.* for repairs, landlord's taxes, insurance, &c., being 18 per cent. on the gross rent of the buildings; making the net annual value for assessment 2,000*l.*

On cross-examination this witness admitted that he had never before been concerned in rating buildings of this character; and in answer to a question from the Bench, he stated, that if a manufacturer had expended 30,000*l.* in erecting a mill, he should rate that at 6 per cent. upon the outlay.

Mr. Nelson, another surveyor, confirmed this statement, only that he valued the water frontage at 2*l.* per foot, and thereby increased the rate. Mr. Nelson stated, that he had been concerned in valuing the parish of Lambeth, and that 6 per cent. on the outlay had been assumed as the basis of similar rating there. On cross-examination he admitted that he knew of no case in which 2*l.* per foot was paid as the rent of any wharf in the parish or its neighbourhood.

Mr. Bircham replied in a speech of much ability, and the magistrates, after deliberating for about half an hour, amended the rate to a gross rent of 2,000*l.*, and a net rent of 1,500*l.*, adjudging each party to pay their own costs.—*From a Correspondent of the Railway Times.*

STEAM NAVIGATION.

NAVIGATION TO INDIA BY THE CAPE OF GOOD HOPE.

A steam vessel now building by Messrs. Scott, Sinclair, and Co., of Greenock, who are also building the engines, has been purchased by the East India Steam Ship Company, as their experiment ship for the voyage from London to Calcutta direct, by the Cape of Good Hope. The vessel and engines are in such a forward state as to warrant the presumption that the first voyage will be made early in January next.

The dimensions of the vessel and engines are:—

	Ft.	In.
Length, from stem to taffrail	200	6
Ditto of keel	189	0
Clear beam midships	32	0
Breadth over the sponsons	48	0
Ditto over the paddle boxes	48	0
Depth of hold	28	0

The main saloon will be 50 feet long by 18 feet wide in the clear, leaving a range of state rooms on each side, opening upon the saloon. The height under the beam will be 8 feet. It is intended to do away with all deck houses or any erections on deck by putting a flush deck on her, which will have the double advantage of giving great accommodation and carrying away those unsightly projections from the deck, which greatly impede the way of the vessel by offering resistance to the wind. When this deck is added she will be equal to 1,200 tons measurement. She is built in a very superior manner, of the best English oak and American elm, copper fastened, and the two bottom planks diagonally bolted, independent of the keel. She is very strongly braced diagonally with iron braces, and her floors are close built and caulked.

The two engines are very strongly and compactly constructed.

	Ft.	In.
The diameter of the cylinder is	0	63
Length of stroke	5	9
Diameter of paddle shafts	0	12½
Diameter of paddles	26	6
Width of paddles	8	0

Number of strokes, 20 per minute.—Paddle float in 3 pieces.

The naves of the paddles are of wrought iron, so rivetted together as to combine great strength with compactness and lightness.

The vessel and machinery are now fitting up under the inspection of Lieut. Kendall, R.N., and Mr. Charles Manby, the commander and inspecting engineer.

Launch of an Iron Ship.—On Thursday, the 18th ultimo, the first iron ship built in Liverpool was launched from the building-yard of Messrs. Jackson, Gordon, and Co., the builders, near the Potteries. As a model this ship is a beautiful thing. She has somewhat of the American build about her bows, has great breadth of beam, and a fine run. With the exception of her decks she is entirely built of iron. She is 271 tons old measurement, 24ft. 6in. breadth of beam, 13ft. 10in. depth of hold, and 96ft. keel, and has 99ft. 9in. for tonnage. All being ready, at 11 o'clock the dagger was knocked down, and the beautiful vessel, with all her masts and rigging up, glided majestically into the river. She was christened the "Ironsides" by Captain Mitchell, formerly of the ship Abbotsford, who is to sail her. It is understood that she is for the Brazil trade. When in the water she floated like a cork, and her masts were as stiff and steady as possible.—*Liverpool Standard.*

The Liverpool Steam Ship sailed from Liverpool on Saturday afternoon, the 22nd ult., on her first voyage to New York. She carried out between fifty and sixty cabin passengers, 150 tons of fine goods, at five guineas per ton, and thousands of letters, papers, and parcels.

Launch of the Archimedean Steam Vessel.—On Thursday, the 18th ult., a steam vessel named the Archimedean, built upon a new principle, was launched from the yard of Mr. Wyan, of Mill-wall, nearly opposite Deptford. Although it had been announced that the vessel would leave the slips at noon, it was half-past one o'clock before the word to "let go" was given. It was then nearly high-water, and the Archimedean glided gently on to the bosom of Father Thames. She was afterwards towed down to Blackwall by the Victory steamer, to have her fittings immediately completed. The principle upon which the vessel is proposed to be propelled is one which has long been in agitation, and which has already been experimentally tried with considerable success upon a vessel of eight tons, and of four-and-a-half horse power, and the objects which it is desired should be attained are at once speed, and the ready application either of steam or sailing power. With a view to attain this end the engine will be placed amidships, as in the steam vessels now in use, and the propeller or paddle, which is under the stern, will be worked by a communicating shaft, acting upon a screw, called the Archimedean screw, in the application or use of which the invention is grounded. The propeller being placed under the stern, the inconvenience arising from the paddles now in use, which act themselves as a back water, is avoided, and great benefit will be derived in seas when the wind is on the beam, when, instead of a great portion of the power being lost, as now, the revolutions of the paddle will continue with as good effect as in calm weather. Should any circumstances render it necessary to remove the steam power, the wheel may be immediately unshipped, or its action upon the water may be prevented, and sailing power may then be applied. The vessel has been built at the yard of Mr. Wynn, under the direction of Mr. Smith, and is of exceedingly elegant construction Its dimensions are as follow:—Extreme length fore and aft, 125 feet; length between perpendiculars, 107 feet; breadth of beam, 22 feet 6 inches; depth of hold, 13 feet; diameter of screw, 7 feet; length of screw, 8 feet; and it is intended to apply engines of 45-horse power.—*Evening paper.*

Steam Navigation.—A few days since the Rainbow, a new iron steam ship, belonging to the General Steam Navigation Company, on her way to Antwerp with the tide, performed the distance from the Brunswick Wharf, Blackwall, to Gravesend, a distance of twenty miles, in one hour and four minutes. We believe this is the quickest passage on record. The Rainbow has become an object of great curiosity from the extraordinary speed she has displayed, and as proving beyond a doubt the safety and durability of iron-built vessels at sea.—*Morning Post.*

The Gorgon Steamer.—The Gorgon steamer arrived at Passages, in 54 hours, from Plymouth Sound, having left that port on the 15th, steaming all the way against a strong head wind. We have heard of no set trial with the Phœnix, but she performed the distance from Passages to Santander on the same day as that vessel, having left the former place, with 600 troops, four hours and a half after her, and when she arrived at Santander found the Phœnix had only anchored half an hour before her, thus gaining four hours in a run of 80 miles, going nine knots and a half against a heavy head sea. Lord J. Hay, and all the officers on the station, have expressed themselves in high terms of the superior qualities of this powerful and magnificent vessel. The report of the efficiency of the engines is so favourable, that the Lords of the Admiralty have been pleased to order Messrs. Seaward to supply a set of similar ones for the Cyclops, now building at Pembroke. Letters from Passages state that the Gorgon steamer, on her way out from that port, caught fire twice somewhere in her paddle boxes, owing to friction.—*Devonport Telegraph.*

At a public meeting held at Sunderland, the mayor in the chair, resolutions were passed and a memorial to the crown adopted, praying that steps should be taken by government to appoint fit and proper persons to examine the machinery and boilers of all steam vessels, with power to interdict their departure where the safety of the public might be endangered.—*Sunderland Beacon.*

Launch of a new Steam Ship at Belfast.—At the beginning of last month, a beautiful vessel, the Aurora, was launched from the ship-building yard of Messrs. C. Connell and Sons, at Belfast. She is decidedly a most superior steam vessel; her model—whether we regard the beauty of the lines from the paddle-boxes forward to the stem, or the gentle curvature of the quarter from the bends to the gunwale, now so much admired in some of the best Clyde-built steamers—is unexceptionable, and has been so pronounced by first-rate judges; while it is evident that speed, combined with large tonnage, on a light draught of water, has been completely attained in her build. It ought to be a source of pride to the enterprize of Belfast, that the Aurora will be wholly of Irish manufacture. Her dimensions are as follow:—Length of deck, from head to stern, 170 feet; breadth betwixt paddle-boxes, 23 feet; actual admeasurement, 453 tons; estimated burden, 750 tons. She will be propelled by engines of 240 horses' power.—*Belfast Whig.*

PUBLIC MEETING OF THE GREAT WESTERN RAILWAY COMPANY.

A crowded meeting was held at the Merchants' Hall, Bristol, Wednesday, Oct. 10, in pursuance of a resolution come to at the half-yearly public meeting, that the adoption of the report should be deferred until the second week in October, it being printed and circulated in the mean time.—Mr. W. U. Sims having been called to the chair, said,—Gentlemen, the circumstances which have caused our meeting this day, must be fresh in your recollections, that the consideration of the report of the directors was deferred at the last meeting, on account of its embracing so many important matters. The directors did not oppose the resolution, and the proper period is now arrived for the meeting to discuss and decide upon its reception. Some decision must be come to this day, for it will be unjust both to the directors and the proprietors to any longer delay it. Such a decision will not, however, commit the company as to any future measures. The directors have abstained from laying before the meeting any official report, being of opinion that such a course will only give rise to discussion, and divert attention from the business of the day I wish, however, to give some explanation upon two or three material points First, the traffic has realized every hope which could have been formed, the receipts for the last 18 weeks amounting to 29,694*l.* 5s. 11d., being an average income of 1094*l.* 16s. per week. The receipts for the month of June were 6,459*l.* 16s.; for July 6,918*l.* 2s. 5d.; for August, 7,154*l.* 10s. 11d.; and for September, 7,599*l.* 19s. 1d. Now with regard to the expenses incidental to the traffic, a full and accurate account has been taken, and it is found that 10,925*l.* 12s. 1d. has covered all the expenditure, with the exception of that which has been required for repacking that portion of the permanent way which was found to be needful. Instead of an expenditure of 300*l.* a-day, with a receipt of only 200*l.*, as was somewhat ingeniously stated, the expenses have been less proportionately than that of other lines. As respects the cost of laying the rails on timber, the directors have found that with a heavier rail of 60lb. to the yard, and a larger scantling of timber without piles, that the cost will not exceed 7,000*l.* per mile, and in truth responsible parties have offered to undertake it for that sum from Maidenhead to Twyford. The contract at Reading, which has been taken from Mr. Ranger, has been let to three sub-contractors, who have engaged to finish it in seven weeks. The meeting will recollect the circumstances under which it was judged necessary to have report from Mr. Nicholas Wood, on the line to Maidenhead; from whom a letter has been received, in which he states that it is his intention to undertake a course of inquiry, and make experiments not only upon the Great Western, but upon other lines, which at present have not been sufficiently extensive to justify him in forming that sound and practical conclusion at which he is desirous of arriving. Subsequent to the last meeting, and in consequence of a suggestion from a shareholder, a reference has been made to Mr. Hawkshaw, the engineer of the Bolton and Bury Railway, and that gentleman has returned a report, which, however, the directors do not consider it fair to lay before the meeting till Mr. Wood has also submitted his report. The directors have, however, no wish to conceal Mr. Hawkshaw's views, which are extremely comprehensive; but his recommendations the directors consider will be prejudicial to the undertaking if adopted. Mr. Hawkshaw recommends a total change of plan—that they should begin *de novo*, take up the rails, and lay them down at the 4 feet 8½ inch gauge. The directors have, however, thought it proper that the report of Mr. Wood should be received before either are submitted, and for that purpose a special meeting of the proprietors will be called to take both those reports into their consideration. After a discussion as to Mr. Hawkshaw's report a proprietor inquired when it would be probable that Mr. Wood's report would be ready? The chairman replied, that Mr. Wood had stated that it would take him three weeks more to finish his experiments on the Great Western line, and probably some two or three weeks more for his comparative experiments on other lines. It might be six weeks before his report would be received, and there would be no objection to print and circulate the reports amongst the shareholders a week or ten days previous to the meeting. After some discussion the chairman said, that for questions to be asked of Mr. Brunel, that gentleman was on the spot and would answer them at once. Mr. Brunel said, that with regard to the engineering expenses, the salaries of himself and his assistants were not so large as those on other lines, and the amount was swelled by the introduction of a number of items which had no connexion with that department. The next observation was on an important point. Mr. Heyworth had drawn a conclusion that he (Mr. Brunel) had a tendency to incur expense *coute qui coute*. Now he held it to be quite as essential for an engineer to show he could build cheap as build well. Mr. Heyworth had read a passage from his report relative to maintaining the width of tunnels. He certainly thought it would be better in a line of 120 miles, where a breadth of 30 feet was kept up throughout, and where there were not above two or three miles of tunnelling, that the same breadth should be preserved in the tunnels, which if once constructed could never be altered, except at an enormous expense. That was his reason, and not for the mere whim of making a tunnel on a larger scale than other railways, and it ought not to be assumed that he had run wilfully and wantonly into expense for the sake of a grand work. Mr. Brunel then proceeded to remark on the question of gradients, and demonstrated that the plan adopted on the Great Western involved a saving of locomotive power to the extent of 26 per cent., and concluded by stating, that he felt convinced that experience would show that the very point which had been urged against him as extravagant would prove to be both economical and profitable. Mr. Heyworth explained that the 26 per cent. alluded to by Mr. Brunel, was applicable only to the power of the engines. He perfectly agreed also with Mr. Brunel, that the object sought to be obtained was a profitable outlay. Professor Babbage entered into a long account of his observations and experiments on different railways. He had conversed with scientific men concerned with twelve railways—he had travelled on seven; and the result of his experience was, that in those seven the Great Western stood as No. 2 for comfort and ease in travelling. From his knowledge of Mr. Nicholas Wood, he doubted not that ample justice would be done; but he ought not to be hurried. Discussions like the present were calculated to do more harm than good, by their tendency to dishearten their engineer, and paralyse the energies of the directors. If the meeting should express a want of confidence in the directors, and resolve upon undoing what had been done, it would retard the progress of railways generally, and be a serious injury to science. Considerable discussion of a friendly nature then took place, Mr. Heyworth stating that he would withdraw his motion for adjourning the present meeting, if the chairman would undertake, that as soon as Mr. Wood had presented his report, and Mr. Brunel had had time to examine it, a special meeting should be called, which was acquiesced in, when it was finally resolved that it should take place in London, on the 20th of December.

PROGRESS OF RAILWAYS.

Edinburgh and Glasgow Railway.—Messrs. Gibb and Son, of Aberdeen, so well known for the execution of the Dean Bridge, the Glasgow Bridge, and other extensive works throughout the country, are the successful competitors for the first and greatest contract on the line of this railway, viz., that from Norton to near Priestinch, being a distance of about five miles. This contract comprehends the great viaduct across the Almond valley. It is the heaviest part of the line, and will require the longest time in the execution. It has been contracted for, on the whole, within Mr. Miller's Parliamentary estimate; and when we look to the names of the respectable contractors, we cannot help thinking that the settlement of this contract on such terms is a matter of the utmost importance, and that it will tend materially to insure the most successful results to this great national undertaking.—*Glasgow Courier.*

The Birmingham, the Southampton, and the Great Western Railway—for all of which one common terminus might have sufficed, and which might, by an early, judicious, and cordial combination of interests, have obtained a common terminus as near as any to the metropolis—have, partly through mischance, and partly through mismanagement, been obliged to have separate termini at distances of 2½, 3, and 4½ miles. The inconvenience thus entailed upon the public is incalculable, yet it is an inconvenience which must now be regarded as remediless. A junction of the three lines, or of any two of them, is, of course, no longer to be thought of; and the apprehension that, were one of them permitted to come any further into town, the proprietors of the others would insist on being equally favoured, will effectually prevent all three from being ever extended much, if at all, beyond their present limits.—*Railway Times.* We do not entirely agree with our contemporary, "that a junction of the three lines is no longer thought of." Such a junction and extension of the three great metropolitan lines must sooner or later be made. After the Liverpool and Manchester Railway was finished, it was very soon found out, by the shrewd merchants and manufacturers of those towns, the great inconvenience of having the termini so far distant from the places of business, particularly the Liverpool terminus, which was extended subsequently at an enormous cost. The same inconvenience, when the metropolitan railways are in full operation, will be experienced; and, unless they do unite, neither one nor the other will be able to approach nearer the city; as the cost of a metropolitan line will be too great for any *one railway singly.* If it had not been for the untoward opposition of the Southampton Railway Company, their line, and also the Birmingham and Great Western, might have been extended to the banks of the river Thames, and within *half a mile of the Royal Exchange and Charing Cross;* but the unaccountable jealousy of the Southampton Railway Company, because the line in question was to have crossed the river Thames and united their line with the *Great Western* and the Birmingham Railway, and offered to the two last the same excellent terminus, caused them to lose the traffic of the Brighton line on six miles of their railway, and all the city traffic of the Great Western and Birmingham Railways, and likewise the enormous traffic of the Richmond branch on two miles, besides *thousands* of passengers to the different towns and villages in the vicinity of the metropolis;* we have not the least doubt that the opposition of the Southampton Railway Company to the line in question costs them *ten thousand pounds per annum* in loss of traffic. We still hope that the line to unite the three railways will be made. The cost of carrying it into Parliament would be trifling, as all the plans and data are in the possession of the projector.

London and Brighton.—The Brighton railway interferes with the Merstham tramway, and the Railway Company are bound, under their act, to purchase the whole of the tramway from Croyden to Merstham at a price to be fixed by arbitrators mutually chosen. The arbitrators have made their award, and the Railway Company are now in possession of the tramway. The claim made by the Tramway Company was no less than 42,000*l.*, and they employed counsel to substantiate their claim, but the arbitrators awarded only 9,614*l.*

Dundee and Arbroath Railway.—The greatest interest was excited at Dundee on Saturday, 6th ultimo, in the ceremony of opening this railway. At a quarter past eleven, six omnibuses departed for the station at Craigie. Twelve o'clock was the time appointed for the departure of the train; and a little before this hour the scene was exceedingly animated and enlivening. There were ten carriages,—five first and five second class carriages,—filled with passengers, amounting to between 300 and 400. The carriages were built in Dundee, by Cuthburt and Son, and in Perth by Wallace, and do great credit to the builders. *The first class carriages* are fitted up in the most comfortable and elegant style, with plate-glass windows and sides, and cannot be surpassed by any description of carriages. *The second class carriages* are also exceedingly comfortable, and are supplied with air cushions, and in every respect as easy as the first class, only they are open at the sides. *The engine* named the "Wallace" was built in Dundee, by Kinmond, Hutton, and Steele, and is without exception one of the most splendid and beautifully finished pieces of mechanism; indeed, all present who had seen the Scorpion, Spitfire, and other celebrated English engines, gave the preference to the Wallace. It has been constructed on the most simple principle; and the taste and style of finish is unequalled. It is placed upon six wheels, the centre or driving wheel being 5½ feet diameter; the other wheels are of less dimensions: the cylinders are placed in a horizontal position; the stroke 18 inches long; the diameter of the cylinder is 13 inches. This engine differs from most of the English locomotive engines, inasmuch as the crank is placed on the outside of the wheels, which adds much to the simplicity, as well as to the efficiency and safety of the machine. *The ceremony* was the opening of a mean of communication which brings Arbroath to the immediate neighbourhood of Dundee, and enables it to participate in the rising and profitable trade of this seaport. The trip was performed in about 40 minutes, but speed was not the object of the directors; and Mr. Miller, of Messrs. Grainger and Miller, of Edinburgh, the engineer of the company, and under whose guidance the engine and train was placed, wisely preferred safety to the chance of any accident, which might without any fault have occurred, where everything was new and imperfectly tried and tested. The train returned from Arbroath to the Craigie station in 40 minutes, exclusive of a stoppage of five minutes. *The length of the railway,* which has been executed, is 15 miles, and it is admitted on all hands to be the finest line for the extent in Britain. The steady motion of the carriages and engine may partly be ascribed to *the gauge* which has been adopted upon this railway, which is 9½ inches wider than the principal English railways, but 18 inches narrower than the Great Western Railway.

North Midland.—The works on the line near Chesterfield are rapidly progressing. The last hill, near Tapton-house, in the contract of Messrs. Leather and Waring, is commenced excavating; and there is every probability of its being finished in June next, when it is expected that the whole of their contract, nearly four miles, will be ready for the permanent rails being laid. It is supposed that the whole line will be opened in January, 1840.

* We should like to see the returns of the company for passengers conveyed to Wandsworth, Wimbledon, and Kingston; we doubt if it would show a tithe or even half that number, of what might have been conveyed had their line been extended to the city.

Grand Caledonian and West Cumberland Railway.—Mr. Locke has abandoned his central line through Shap Fell, and given up all opposition to the Morecambe Bay line. Mr. Locke states:—"There is no question as to the route it ought to take. The London and Birmingham, the Grand Junction, and the North Union, line may be considered as already made (in two months they will be opened throughout). They form one grand line from London to Preston, pointing upon Carlisle; thus one half of the line from London to Glasgow is accomplished. The population of Lancashire, its position, and connexion with the trading districts of Scotland, place the eligibility of this route above all others pre-eminent. The population of the whole district from London, along the eastern side of the Island, to York and Newcastle-upon-Tyne, when compared with that of Cheshire, Staffordshire, and Lancashire, is insignificant; and to such towns as Liverpool, Manchester, Warrington, Stockport, Macclesfield, Ashton, Oldham, Rochdale, Bolton, Bury, Blackburn, Wigan, and Preston, a communication with Scotland must be of immense importance; and whilst all this can be accomplished, and still preserve the most direct and shortest route from London to Glasgow, there can be no plea against such a communication being made through Lancashire."—*Lancaster Guardian.* Mr. Hague has also finished his special survey of Morecambe Bay.—Measures are in progress to bring forward this great national undertaking, and a meeting of the subscribers will shortly be held to receive Mr. Hague's report, and consider as to future measures. We understand that the proposed line crossing Morecambe Bay was projected by Mr. Hyde Clarke. The boldness of the proposal, when first made, was laughed at by all the county; we see, by the above extract, how time and perseverance may overcome prejudice and ignorance.

Great Western Railway.—We understand that the contract for executing the line between Ruscomb and Reading, which was forfeited by Mr. Ranger, to the great obstruction of the company's plans, is now subdivided into four portions, and re-let to contractors, who are bound to complete the line within seven months. Should they succeed in their undertaking, the whole distance between London and Reading will be opened for traffic in the course of the next summer. Between Bath and Bristol, and on the eastern side of Bath, increased activity is manifested by the various contractors. We learn that a very large body of men, recently discharged in consequence of the completion of the London and Birmingham Railway, have been set to work at various points of the Great Western Railway. The principal engineer is strict in enforcing penalties for the non-completion of a due quantity of work within the time specified, and everything indicates much determination and energy in the direction. Still the operations are on such a gigantic scale, and the obstructions of tunnel work so formidable, that we do not look for the perfect completion of the line for a very long time.—*Berkshire Chronicle.*

Leeds and Manchester Railway.—The report of the directors read at their half-yearly meeting, states that the road to Littleborough, through Rochdale, will be opened in May next, and the whole line is expected to be completed in the year 1840.

Northern and Eastern.—A most important negotiation between the Northern and Eastern Railway Company and the directors of the Eastern Counties has been brought to a conclusion, by which it is agreed that the two lines shall have one common terminus at Shoreditch, the land for which is already in possession of the Eastern Counties line, while the works which connect it with Bow and Stratford are in rapid progress, as may be seen by any one who crosses the valley of the Lea.—*Hertford paper.* We understand that the terms of the bargain between the Northern and Eastern and Eastern Railway Companies are, that the former are to pay 7,000l. a year for the use in common of the Eastern Counties' London Station, and 4d. per passenger. A good bargain, if the passenger traffic on the Northern and Eastern Railway prove to be, as anticipated, nearly as good as the traffic of the Eastern line itself. The toll which the Croydon Railway Company are to pay the Greenwich is, we believe, the same, namely, 4d. per passenger, but they are to provide their own station.—*Railway Times.*

The North Union Railway was opened on the 21st ult., from end to end. This line connects Preston with the Grand Junction. The entire line, from Parkside to Preston, measures 22 miles and a half; the first two miles and a quarter are up a slight incline and curve; next come four miles of dead level, and perfectly straight. A steep incline, rising at the rate of one in a hundred, brings the traveller to the town of Wigan, the company's first station on the line. Here a splendid station-house has been erected, alike well adapted for the transaction of the company's business and general public accommodation. The line is carried, by means of an iron bridge, supported by massive pillars of the Doric order, across the turnpike-road leading into Wigan. This commences the Douglas contract, undertaken by Messrs. Mullens and M'Mayor, which extends five miles along the line to Coppull, through some exceedingly heavy embankments and cuttings, in some places full 60 feet deep. In this distance there are two inclined planes, the highest rising in the ratio of 1 in 100. Coppull forms the summit, and here commences the Yarrow contract, which is carried across one of the most beautiful valleys in England. From Coppull to Yarrow there are inclined planes, two short ones, and the third extending to more than a mile in length, and formed by embankments raised in places more than 60 feet above the the natural level. The chief alteration in this line is the wooden bridge across the river Yarrow. It will be recollected by those conversant with railroad affairs, that a culvert of considerable extent had been formed across the river, and the embankment placed upon it. The flood of last November caused the river to overflow so considerably as to blow up the arches, and to carry away the embankment to a very considerable extent. The loss to the contractor was estimated at nearly 6,000*l.* In the place of this culvert and embankment a bridge, made of framework, has been erected. It is 73 feet above the bed of the river, 400 feet long, and 82 feet wide, and in its construction more than 30,000 feet of timber was used. There are two more inclines between the Yarrow-bridge and Preston, one at Leyland, the other at Farrington; and immediately previous to reaching Preston there is a deep excavation, 41 feet, cutting. At this place the engine was stopped, and the directors there terminated their trip. The distance from end to end was performed in 45 minutes. The directors in their trip were preceded by the No. 5 engine, built by Messrs. Hicks, of Bolton, which, with Messrs. Jones and Co.'s engine, worked admirably.—*Times.*

Glasgow, Paisley, and Greenock Railway.—The directors, we are happy to learn are pushing on their works with spirit, and, since we last noticed their proceedings, have let two more portions, viz. :—the Greenock and Cartsburn Hill contracts; the former to Messrs. Allison and Brodie, and the latter to Mr. Barron, of Glasgow. Both are to be completed next year. The Finlayston contract is already advertised; and this, with the short length from the river Gryfe to Paisley, which is immediately to follow, and for which the plans are ready, will complete the line to Glasgow.

Irish Railways.—Meeting at Ballinasloe.—The meeting of the gentry and landholders of the province of Connaught, on the subject of the report of the railway commissioners, was held on Saturday. Mr. Bodkin, M.P., presided. The requisition for this meeting was signed by the Marquis of Sligo, the Earl of Lucan, several members of Parliament, and thirty-six deputy-lieutenants and magistrates of counties. The object was to protest against the line of railway recommended by the commissioners. The following resolution was amongst those adopted:—"We are of opinion that the construction of railways in Ireland should, as in other parts of the empire, be left to private enterprise, aided, assisted, and controlled by government, as Parliament should decide upon, according to the usual and accustomed rules, founded upon evidence, with due regard to public interests and private rights." A vote of thanks was passed to the *Times* and several other journals, English and Irish, which had "advocated the claims of Ireland to railway communication, in opposition to the conclusions of the commissioners."

Hull and Selby Railway.—It is now some time since we made any allusion to the progress of this undertaking, and we therefore now lay before our readers such information with reference to it as has come within our knowledge. A considerable number of men are employed upon the various contracts, and the contractors are exerting themselves to complete as much of the work as possible previous to the winter; about 150 yards in length of the embankment at the west end of the Foreshore, near Hull, are completed, and 100 yards more raised to the full height; a great part of the stone facing is also finished. The trench at the foot, for a further distance, is also excavated, and part of the embankment thrown up; a considerable quantity of stone and chalk has been delivered for this work. The embankment at the east end of the Foreshore, near Mr. English's wharf, is in progress. On the Hessle contract, the embankment from Dairycoates to Hessle Harbour is nearly finished and ready for ballasting, and the various culverts wholly or nearly completed. The cuttings westward, at Hessle and Ferriby, are proceeding favourably, although the wetness of the season prevented the great progress which would have been made under more favourable circumstances. The Brough contract has been commenced, and when all the corn is cleared off the ground, the works will proceed more rapidly. The Market Weighton embankment requires only 6,000 cubic yards of earth to finish it, and the foundations of the bridge over the canal are ready to receive the ironwork, which is all prepared, and daily expected from the foundry at Derby. On the Howdon contract (a length of nine miles), only a small part of the formation of the railway at each end remains unfinished, and this is in progress; near 4,000 tons of chalk have been landed, and partly broken for ballasting; several culverts are finished, and the bridge over the railway at Eastrington is commenced: a considerable quantity of bricks have been made for the use of these works. The foundation of the bridge over the river Derwent, on the west side, is nearly ready for the piling, and the coffer-dam on the east side finished. The cutting west of this river is progressing, and the earth is carted to form the embankment. The other works of the Selby contract will proceed as the land is cleared of corn. The sills upon the pier-piling of the Selby bridge are fixed as opportunities are presented at low water, and in a few weeks it is expected the whole will be completed so as to allow the founders to put up the cast-iron standards, which are all ready for fixing. The Manchester and Leeds Railway Company design to open their line in 1840; this is also expected to be the case with the York and North Midland, and other lines with which that from Hull to Selby will be connected; and we may, therefore, anticipate the arrival of the period when the journey from Hull to London will be accomplished by railways in little more than half the time it now occupies. The advantages to be derived from railway communications cannot yet be fully estimated.—*Hull Times.*

Midland Counties Railway.—There has been an interruption this week to the making of the embankment on the left of the Humberstone-road, owing to the bridge across the turnpike not having been so far completed as to permit the gang waggons to pass over it. From this cause many excavators and other people have been unemployed, but it is expected that they will resume their work next week. It seems that the fixing of the iron "ribs," or arches, across the road, is found a difficult task, and occupies much time. One-half of the new bridge on the London-road being now in a state to pass over, the other portion of the road is about to be broken up in order to complete it.—*Lincoln Gazette.* The following is the amount of earth work executed, and the number of men, horses, and locomotive engines employed, on the works of the Midland Counties Railway Company, from the 27th of August to the 22nd of Sept.: earth work, 203,037 cubic yards; number of men, 4,373; number of horses, 438; locomotive engine, 1.

North of England.—There having been various reports that the North of England Railway Company did not contemplate the extending of their branch to York, we have authority to contradict all such reports. The fact is, that the extension to York is positively determined upon; land has been purchased, proper arrangements have been made, and a memorial has even been sent to the corporation of York, soliciting their assistance in forwarding this great public undertaking. The branch will terminate on the west side of Thief-lane, directly opposite the House of Correction.—*York Herald.*

Birmingham and Gloucester Railway.—The men employed on this railway on the line between Moseley and Camphill, are now prosecuting their labours both night and day, when the weather permits. The second arch, which connects the land severed by the railway at Balsall Heath, is now in course of erection.—*Birmingham Advertiser.*

Preston and Wyre Railway.—The works of this interesting line are in a very forward state; and being a continuation of the grand chain of railways to the north, the town of Fleetwood, on the coast of Lancashire, will be accessible by railway travelling in ten hours, as a fashionable watering-place for the inhabitants of this great metropolis.

The construction of the proposed new road from Amesbury to Kennet, if carried into effect, will confer a great public benefit on the county of Wilts, and will be the nearest connecting link betwixt the Great Western and the Southampton and Salisbury Railways.—*Railway Times.*

Manchester and Stockport Railway.—The Stockport length of the Manchester and Birmingham Railway has been commenced by the contractor, Mr. John Brogdon, of Manchester, in good earnest, nearly half a mile of ground from Blacbrook to this town having already been broken. About 150 men are engaged in the cutting; and already has one of the main depths of 22 feet been obtained and cleared out a considerable distance, in which temporary rails are being placed for the purpose of carrying the superfluous soil away towards Manchester, where great quantities will be required to fill up the declivities. Mr. Brogdon's intention is, we believe, if possible, to complete his contract between the Hyde-road and this town within eighteen months, although the time for the completion of the work is limited to twenty months. The immense viaduct over Heaton-land and the river Mersey is to be proceeded with immediately; and the line to the point of junction with the Grand Junction Railway, at Chebsey, near Stone, is to be now pushed forward as quickly as possible.—*Stockport Advertiser.*

South-Eastern Railway.—Last week the chairman of the board of directors, accompanied by Mr. Cubitt, engineer, and Mr. Fector, M.P. for Maidstone, a director, inspected the works now in progress in this immediate neighbourhood (Canterbury). Great satisfaction was expressed at the advance made since the last visit of the directors; and the facilities anticipated in working through the chalk have been realized to an extent far beyond that of the most sanguine of its promoters. The line between this place and Folkstone has now been finally determined upon; and in the course of a fortnight the plans and specifications for contracts throughout to Folkstone will be ready for inspection by parties desirous of contracting for the same. From Folkstone upwards there is only one work of importance on the line—viz., at Beachborough. Beyond this point, the whole line to its junction with the Brighton Railway in the county of Surrey presents no works of a serious character. The central district from Ashford to the westward is, we believe, quite unparalleled in the facilities which it offers in its construction. For a length of 45 miles, from Ashford to its junction with the Brighton Railway, the line is perfectly straight, with scarcely any cutting, and so nearly approximating a level as to afford scope for the attainment of the highest velocities of which the locomotive engine is capable. The works will be executed at an expense very far short of the average of railways, and, from the contracts which have already been let, we have every reason to believe that the Parliamentary estimates will be more than sufficient to meet the expenses of their construction.—*Kent Herald.* The contract for the line of railroad from Tonbridge to Tudely has been taken by Mr. Charles Dutton, who has executed several heavy contracts under Mr. Cubitt.—*Cinque Ports Chronicle.*

Carlisle and Maryport Railway.—It is intended to open the first nine miles of this line, from Aspatria to Maryport, on the 18th of June, 1839.—*Carlisle Patriot.*

North Union.—The works of this railway every day continue to advance, step by step, towards their completion. On Tuesday the last keystone was inserted in the last arch of the Ribble viaduct, and two engines are daily plying between this town and Leyland, for the conveyance of ballast, and the removal of earth for the slopes or embankments. Should the weather continue favourable, no doubt appears to be entertained but that the entire line will be opened towards the middle of next month.—*Preston Chronicle.*

The Railway Bridge over the Tyne at Blaydon is now completed, connecting the branch that runs north of the Tyne into Newcastle, with the main line of the Newcastle and Carlisle Railway. This branch is so far advanced, that, in a short time, trains will enter the town by this route, instead of proceeding to the Redheugе station.—*Dumfries Times.*

Brighton and Dieppe Railroads.—We are happy to find that the works of these two railroads, in both of which Brighton is most materially interested, are being carried on with great activity. It is said even that the Dieppe line will be first completed, and that great improvements will be made in the harbour of that town for the accommodation of steam boats and other vessels. At Merstham in Surrey there are a great number of men employed—upwards of five hundred—and the line from London to that place is in such a state of forwardness that tenders have been made to coach the remainder of the road to Brighton. Temporary trams have been laid along the branch line to Shoreham, upon which the carts for the removal of the earth will shortly run; and we shall not be surprised if by the next summer this portion of the line is opened for the conveyance of passengers and goods. The formation of the railroad through the centre of Sussex must be attended with the most decided advantages to Brighton; but, taken in connection with that of Dieppe,—by which the metropolis of England and that of France will be brought within a few hours of each other—*Brighton Herald.* Two thousand six hundred workmen are now fully employed on the Brighton railroad, and the works are carried on with great spirit. The branch to Shoreham has been partially carried forward, as far as Portslade, and the carts on the trams are engaged in removing the earth on the higher grounds to fill up the valleys. Several culverts and bridges are completed. The work is done in the best and most substantial manner.—*Hampshire Telegraph.*

Sheffield, Ashton-under-Lyne, and Manchester Railway.—Several contracts with landowners have already been completed upon the most favourable terms, and that the directors are in treaty with other parties, with every prospect of a similar result. The engineer has also received instructions to proceed immediately with the driftway through the summit ridge, and other works connected with the tunnel.

The Shoreham Railway.—The works are carried forward with activity. The men are labouring most industriously at the cuttings leading to the spot opposite the mill, where the tunnel will commence. The shafts appear to be in order for working, and the tunnel was commenced, it was understood, on Saturday last. A considerable excavation has been made on the Hove-road, leading to Blachington, in which a very handsome and substantial bridge, with an elliptical arch, has been constructed. The ground here is on the level of the railroad, which has rendered this excavation necessary in order to carry it over the public road.—*Brighton Herald.*

Great North of England Railway.—It is expected that this line will be ready for traffic in the spring of 1840, simultaneously with the York and North Midland, the North Midland, and the Midland Counties' Railways—thus at once giving the public in the north a direct railway communication with the metropolis. We hope to be able to give some further particulars of the line next week.

Glasgow, Paisley, and Ayr Railway.—Since the fields have been cleared, a large number of additional hands have been employed on this railway, and the operations to the westward of Arkleston Tunnel, as well as to the eastward of it, are proceeding with much activity.

Railway from Manchester to the Humber.—We learn that a survey of the proposed line from the Sheffield and Manchester Railway, near Penistone, to the Humber, is now proceeding under the superintendence of Mr. Locke.—*Sheffield Iris.*

Accident on the Liverpool and Manchester Railway.—On Thursday evening last, between the hours of 8 and 9, as a heavily laden luggage train was proceeding from Liverpool towards Manchester, the engine was thrown off the line at the Newton junction, in consequence of the man whose duty it was to shift the rails after the Birmingham train had passed neglecting to do so. The result of this carelessness was calamitous in the extreme, a poor fellow named Hannon being killed on the spot, and the "breakman" so dreadfully injured that his life is despaired of. The escape of the engineer and fireman was miraculous. Hannon was riding in a carriage with a number of pigs intrusted to his care, 30 or 40 of them also being killed.

Accident on the Great Western Railway.—Much excitement was on Friday, the 26th ult., created throughout the metropolis by a report that a dreadful accident had occurred on the Great Western Railway, which had proved fatal to Dr. Dionysius Lardner. The report is unfounded as respects the Doctor, but we are sorry to add, that an accident attended with fatal consequences has occurred on this line, and that the unfortunate gentleman whose life has been sacrificed is Mr. Field, connected, it is said, with Dr. Lardner as pupil or assistant. The circumstances connected with the lamentable occurrence have been kept very private, the greatest secrecy having been enjoined on all the servants of the company; but from inquiries instituted by our informant in the vicinity of the railway yesterday, the following particulars have been obtained:—For some time a series of experiments have been in progress on the line between London and Maidenhead, for the purpose of trying the powers of the engines and the stability of the rails and permanent ways. On Thursday last the "Eureka" engine started from the terminus at Paddington, with an experimental train, consisting of several carriages and trucks, heavily laden with iron and stone. On the tender of the engine were Mr. G. Clark, Mr. Dickson, and Mr. Clarkson. The party reached Maidenhead without any accident, and left about 4 p.m. on their return. During the afternoon Dr. Lardner and Mr. Field, being engaged in proving the rails near the London terminus, were on the approach of the "Eureka" on the eastern side of the intended station at Acton, near to Wormwood Scrubs. Mr. Field was at the moment stooping down, more narrowly to watch the effect of the approaching train upon the rails, but, miscalculating its distance, or suddenly losing his presence of mind, he was unable to recover himself before the train arrived, and the wheels of the engines passed over his body. The train was almost instantly stopped, and the unfortunate gentleman was found in a dreadfully mutilated condition. Life was not however extinct, but after breathing for two or three minutes he expired. His remains were conveyed to Paddington, and deposited in one of the offices of the company, to await the coroner's inquest.—*Times.*

FOREIGN RAILWAYS.

The Versailles and St. Cloud Railway.—The keystone of the vault of the tunnel at St. Cloud, was laid by Messrs. Lanjuinais and Emile Pereire, the administrator and director of the Company. The first stone of the tunnel, which is more than 1,500 feet in length, was laid on the 26th of March. Some masonry work is all that now remains to be terminated. The removal of the earth is going on with great activity, and will be finished in a month. All the vehicles and other *materiel* have been directed upon Versailles; but as there remains but little work upon the line, several brigades of workmen have been discharged, amounting for the last month to upwards of 1,500 men.

Railway from Florence to Leghorn.—The committee of the company who have proposed to undertake the construction of the railway, consider it their duty to inform the shareholders, that on the 6th of August last they concluded in London a contract with Robert Stephenson, Esq., one of the most celebrated men England boasts of for large undertakings of this character. By this contract, Mr. Stephenson binds himself to prepare a statement of the estimated expenditure of the proposed railway, and to transmit the same on or before 31st May next. For this object, two of his principal assistants have already arrived, viz., Mr. William Hoppner and Mr. Richard Townshend, who immediately commenced operations, and the Imperial and Royal Government have been pleased to recommend these gentlemen to all the government and local judicial authorities, to obtain from them every assistance and protection in their operations.—*Gazzetta di Firenze.*

The *Journal de St. Petersburg* states that the number of passengers on the railroad between St. Petersburg and Zarskojeselo during August last was 73,191; and between Zarskojeselo and Paulovsko, 26,088; making together 99,279 The receipts amounted to 126,504 roubles. Since April last, the total receipts have amounted to 514,541 roubles, and the number of passengers between St. Petersburg and Zarskojeselo to 287,643.

French Railways.—A panic has seized the holders of shares in these undertakings which are all below par, except the Versailles (right bank) and the St. Germain. The Paris press is much occupied with these circumstances, and display a great deal of, what we should consider, infantine reasoning on the subject.

Austria.—The second section of the Great Northern Railway, named after the Emperor Ferdinand, has been opened. This division runs from Deutsch Wagram to Unter Ganserndorff.

Haarlem Railway.—The works on the railway between Amsterdam and Haarlem proceed rapidly, and it seems that the opening of it may be confidently expected to take place in the spring of 1839.

Brussels Railroad.—The concourse of passengers at the station of the Brussels railroad increases daily. On Saturday last there were above 80 carriages drawn by two engines at half-past eleven o'clock. Of the 600 or 700 passengers a company of the 3rd regiment of the line formed a part.

Austrian and Russian Railway.—A company of capitalists at Brody, in Galicia, have made proposals to the Austrian and Russian Governments for forming railroads from Brody through Lemberg to Vienna, and from Brody by Berdytscheff to Odessa, on condition of enjoying the exclusive privilege of the road for 100 years, after which period the roads are to be given up to the respective Governments of the two countries. The proposal is said to have been received with so much favour at Vienna, that agents of the company have already entered into negotiations with the proprietors of lands through which the Austrian road is to pass; and the Emperor of Russia is stated to be still more inclined to listen to the application, and he is anxious to multiply these roads within his dominions, and in this case is not required to make any advance of money. The moneyed houses of Vienna are said to be well disposed to the undertaking.—*French paper.*

The railway and steam navigation conveyance between Paris and London, or Paris and Portsmouth and Southampton, is now complete, attended with many comforts and scarcely any inconveniences. A party of English gentlemen left Paris by the new railroad last Thursday morning (Sept. 20) at 7 o'clock. They arrived at the steam-boat station on the Seine in less than one hour. They embarked about half-past 8, and landed at Rouen about 10 in the evening. Next morning at 6 o'clock they embarked on board a magnificent steamer, abounding with every luxury, and, after enjoying a most picturesque and varied voyage down the Seine, arrived at Havre soon after 12 o'clock, mid-day. They instantly shifted their quarters to the noble steam-vessel the Monarch, quite ready to sail. They reached Portsmouth and Southampton in the middle of the night, or soon after, and were in London in good time on Saturday, having reposed quietly in their hotels on Thursday and Friday nights.

ENGINEERING WORKS.

Proposed Harbour at Hastings.—A meeting of the committee appointed by the inhabitants of Hastings, to consider the practicability of constructing a harbour at that place for the trade of the town and steamers, at an expense not exceeding 60,000*l.*, was held on the 19th ult., to receive Mr. Cubitt's report on the plans of Lieut.-Col. Williams, R.E., and Mr. John Smith, which had been submitted to him. Mr. Cubitt's observations on the plan of Lieut.-Col. Williams were listened to with the deepest interest, and it was the subject of very general regret that he considered the sum of 60,000*l.*, to which the committee were limited, insufficient to complete the work in an efficient manner. Colonel Williams, however, said he should be prepared by the next meeting to show that his harbour could be made a good and efficient harbour for that sum. The difficulty which engineers have to contend with on this coast is the shifting shingle, the general course of which is from west to east, and which accumulates in immense masses on the west side of any piers or other works which obstruct its progress, and finally getting round them finds its way into the harbour, many of which on this coast become, as they are very aptly termed, "shingle traps." Another difficulty is presented by this obstruction, in the direction in which the mouth of the harbour should be made, if towards the south and south-west, the quarter most easy of access in gales from those points, it is expressly adapted to catch the shingle getting round the western pier, and if towards the south-east, whereby making the west pier overlap the eastern, it is thought this evil may be remedied, the harbour becomes more difficult to enter. Mr. Tait's ingenious plan for harbours of isolation, particularly noticed in our last number, seems calculated better than any other hitherto suggested to meet this difficulty; but as it has not yet been tried in practice, the inhabitants of Hastings would no doubt object to make the experiment of its merits, did not the increased expense present in itself a serious objection. The revenue for the harbour at Hastings, from the trade of the town and nighbourhood, would produce nearly 4,000*l.* a year on a scale of moderate tolls, and the proposed outlay of 60,000*l.* would be justified. The materials for building the piers are on the spot, the cliffs being composed of good sandstone, and a hard description of lime or Tilgate stone, very fit for the purpose. The tides rise on an average, at spring tides 22 feet, and at neaps 19 feet, circumstances very favourable for the undertaking; and the inhabitants are very sanguine that some plan may still be projected which will enable them to complete so very desirable a work for the sum placed at their disposal. Mr. Cubitt prepared a plan in 1837; it was however on too large a scale to suit the means of the town, the estimate being 150,000*l.*, and it does not appear to be his opinion that a sufficient harbour can be built under 100,000*l.*; it is singular, also, that being requested to advise the committee how they could lay out their 60,000*l.* in the most advantageous manner, he should now recommend an extension of his original plan, already too expensive, and thus tend to increase the difficulty he was solicited to remove, without showing how the expenses are to be met. A proposition was made at the committee meeting to call in the assistance of some other eminent engineer, but it was ultimately determined to print and circulate Mr. Cubitt's report, and the plans referred to him, and to meet on the 2nd November to reconsider them, and to hear Colonel Williams' explanation.

Irish Surveyors.—We find from the report on education in Ireland, that the Agricultural School, at Templemoyle, in its course of instruction, includes geography and map constructions, Euclid, trigonometry, and its application to heights and distances, land surveying, with use of theodolite, level, &c. The School has a good apparatus. Several of the pupils have been employed as ordnance surveyors, or by private gentlemen. The age of admission is about eighteen.

Harbour of St. Helier, Jersey.—The Committee of Piers and Harbours met for the purpose of taking into consideration the projected plans for enlarging the pier of St. Helier; and we have much pleasure in announcing that this committee approved unanimously of the plan drawn by Mr. Walker, and resolved upon recommending its adoption to the States.—*Jersey News.*

Deepening the Bed of the River Mersey.—It has been notified to the inventor of a plan for deepening the bed of the River Mersey (submitted to the mayor and corporation of Liverpool so far back as the month of May last), that, after his plan for deepening the bed of the river by means of a system of agitators had been several times submitted to the Dock Committee, they could not enter into negotiation with him on the subject of his invention, "as an apparatus for dredging the banks outside," which, it is said, has been proposed by their own marine surveyor, has been ordered to be tried. Mr. Tait's plan was certainly not to dredge, but to agitate, or harrow, or rake, the bed of the river, during ebb tide only; and we much apprehend that "to this they must come at last."

Bridge over the River Severn.—It is rumoured that a bridge will be built over the Severn at Newnham, and that the matter is to be taken up by Government. It is assumed that the mineral wealth lately brought to light in the Forest of Dean has tended much to the desire to improve the communications in this part of the country.—*Gloucester Journal.*

Woolwich Dockyard.—The whole of the concrete blocks have been removed out of the interior of the great dry dock, and at a cost, per contract tender, of 30,000*l.*, and it is now to be faced with real stone. This dock has already cost the country upwards of 70,000*l.*, and as yet not a ship or vessel of any description has been received within its gates or cassoon. In dimensions it is, perhaps, one of the finest in our ports.—*Standard.*

Southampton Docks.—In our second number we noticed the project of forming Commercial Docks at Southampton, and in a general way the advantages and peculiar eligibility of the site were pointed out. On Friday, October 12th, the first stone of the first dock was laid by Sir Lucius Curtis, Provincial Grand Master of the Free and Accepted Masons of Hampshire. In the evening the directors and their friends, with the Earl of Yarborough, Sir Lucius Curtis, &c., dined at the Star Inn, in honour of the occasion, when the usual toasts, embodying the hopes and promises of the undertaking, were proposed. The masterly speech of Richard Hathfield, Esq., grasps the subject so completely, and displays such a perfect insight into the secrets of commerce and its progressions generally, that we recommend it to the notice of our readers. We regret that we cannot find space for it in our journal. We understand it to be the intention of the spirited and enlightened directors to form the Docks upon the most perfect plan, and to avail themselves of the very best opinions and methods the science of the day can supply. We look forward, therefore, to the completion of this work as one of more than usual interest and importance.

CHURCHES, PUBLIC BUILDINGS, AND IMPROVEMENTS.

St. Saviour's, Southwark.—At a late public vestry in this parish the following resolution was carried:—"That the population of this parish (St. Saviour's) being upwards of 19,000, and the part of the church now capable of being appropriated for divine service being not only very inconvenient, but also very deficient in extent; and it appearing from the information of the parish surveyor (Mr. Rose) that an entirely new church might be built on the site and foundations of the ruins of the nave, or western part of the present edifice, the exterior of which new church might be made suitable to the appearance of the other parts of the present building, while the interior should be so constructed as to furnish the requisites of a church fit for a congregation of 2,000 persons; and with strict economy the whole of such new church might be built, fitted up with galleries, &c., the organ removed and replaced, the church lighted with oil or gas, and properly warmed, and the communication with the tower and other parts of the church completed, so that such new church should in every respect be fit for divine service, for a total cost of not exceeding 8,000*l.*, this vestry authorises the churchwardens to apply to the commissioners, under the act of Parliament, for a loan of 8,000*l.*, for the purpose of building and completing such new church."

Christ Church, Surrey.—This church, situated in Blackfriars-road, which has long stood in need of some very substantial repairs, is to undergo a thorough cleansing and repairing.

Bristol Cathedral.—The removal of the seats in the outer choir of our cathedral, which has been carried into effect, has already much improved the appearance of the interior. Among the intended improvements are the shutting up of the present north doorway (a substitute for a much more beautiful arch on the same side, which is to be re-opened), the construction of a grand western entrance, and the removal of the incongruous Grecian front to the old Gothic altar screen. On either side of the communion-table under the east window a mass of masonry has been removed, throwing open two beautiful arched recesses, and it is very probable that when the ornamental incumbrances to which we have referred are taken away, a similar and perhaps larger recess will be disclosed in the centre. The Very Rev. the Dean, we are told, by whose directions these improvements are being carried into effect, takes a lively interest in the restoration of this beautiful church.—*Bristol Journal.*

New Church at Wetherby.—The site fixed upon for this church is to the north of the town, near the Barley-field-lane. We believe the ground has been given by Mr. Greenwood, a large landed proprietor. The handsome donation of 300*l.* has been transmitted by General Wyndham, the lord of the manor.—*Leeds Intelligencer.*

The Monument to the Memory of the late Duke of Sutherland.—The colossal statue of his Grace, which has been four years in progress, will be erected on the summit of Benvraige, in the course of the ensuing fortnight. It is thirty feet high, and can be discovered at a distance of 80 miles. The artists employed in the work have had a handsome house assigned to them at Dunrobin by the noble relict of the late Duke, and a cast of the head of the statue has been placed, at the desire of her Grace, in the summer-house of the Castle.

The Statue of James Watt, by Sir Francis Chantrey, is now placed in the building erected for it in Union-street, Greenock. It is what is technically called an eight foot figure, and the posture is exactly the same as that of Watt's statue in George Square, Glasgow. The figure is of statuary marble, and weighs upwards of two tons, and the pedestal, which is of Sicilian marble, weighs about three tons. On the front of the pedestal is the following inscription from the pen of Lord Jeffrey:—"The inhabitants of Greenock have erected this statue of James Watt, not to extend a fame already identified with the miracles of steam, but to testify the pride and reverence with which he is remembered in the place of his nativity, and their deep sense of the great benefits his genius has conferred on mankind. Born XIX January, MDCCXXXVI. Died at Heathfield, in Staffordshire, August XXV., MDCCCXIX."

Park Improvements.—We do not wish to arrogate anything to our Journal that does not belong to it, but we cannot but remark, with great satisfaction, that the improvements suggested in the number of June last by our correspondent J. H., of the removal of the southern boundary wall of Kensington Gardens, and the substitution of an iron railing, is fast proceeding. Let the idea come from where it will, we are equally gratified, and we hope that this fall will see the removal of the trees from the front of the statue of Achilles.

FOREIGN INTELLIGENCE.

France.—It is said to be in contemplation to erect in the dockyards of all the naval ports of France steam-engines, with the requisite machinery for making bread and biscuit for the navy, instead of manual labour, as at present is the custom.

The new Suspension Bridge over the Danube, between Buda and Pest, which will be begun the next spring, is a colossal undertaking. Two piers of granite and the red marble of Neudorf, 35 feet thick, and 150 feet above the level of the foundation, will support the whole structure. There will consequently be three openings for the water to pass through, the middle passage being 640 feet in width, and each of those at the sides 270 feet, making in all 1,180 feet. The entire length of the bridge will be 1,600 feet. Cast iron beams will support the platform, which is to be 37 feet wide—viz., 25 feet for the carriage way, and 6 feet for each footpath. The whole will be suspended by 12 chains, weighing together upwards of 2,000 tons.—*French paper.* This bridge, we are happy to announce, is to be constructed under the superintendence of Mr. Tierney Clarke, whose abilities in this department of engineering are well known.

Cathedral at Cologne.—The King of Prussia has granted 10,000 crowns towards the repairs of the cathedral. The contributions to these works during the last year have only amounted to 2,124 thalers, of which the inhabitants of Cologne and its suburbs paid half. The amount of the collections in 1836 was no more than 972 thalers.

The beautiful Palace at Genoa, formerly occupied by Queen Maria Theresa, is about to be converted into a convent, having been granted by the King of Sardinia to the Society of Jesuits.

Portugal.—A company has been formed to navigate the Tagus and the Sadao, and the Sartorius steam-vessel has already been placed on the station.

Russia.—A canal, by which the first cataract of the Dnieper is avoided, has already been dug, under the direction of Lieut.-Col. Schypar, of the engineers. The works are commenced for rendering eleven other cataracts of the river navigable, and it is hoped that they will be completed by the end of August next year. Thus there is a prospect of a very easy communication between the Baltic and the Black Sea, and by means of the Don—between which and the Wolga a canal is begun—these two seas will have a communication with the Caspian. A company established last year for the navigation of the Dnieper has already a capital of 8,000,000 of rubles. (Qy.?) It is having several steamboats built, the engines of which are to come from England. The seat of the company will be at Kiew, where a large depôt is to be erected.

Bridge at Bordeaux.—When this bridge was built, Napoleon insisted that the arches should be sufficiently extensive to admit of a frigate passing through them without her masts. The soundness and utility of this idea has just been proved. The Chilian, 46-gun frigate, launched a few days ago, has been taken through the bridge, and moored off the quay, without the slightest accident.

Luxor Obelisk.—Cost of a single Stone.—The conveyance of this object to France cost nearly 40,000*l.* The law of the 27th June, 1833, granted 12,000*l.* for the embellishment of the Place de la Concorde, and the laying down of the obelisk, in addition to 2,000*l.* voted in 1832. In 1835, 5,600*l.* was paid for conveying the monument from the river bank to the centre of the place. This conveyance, the laying down, and the accessories, cost 22,400*l.*; the granite base cost upwards of 7,600*l.*; so that, altogether, the *one stone* monument has cost France an expense of more than 70,000*l.*

Paris.—Among the improvements of Paris contemplated, or in course of completion, we understand that the branch of the Seine which runs on the northern side of the Isle Louviers is to be filled up, and a quay is to be erected on part of the new ground, the rest being covered with houses. The alterations at the Hotel Dieu are to deprive it of only 300 beds, but the same number will be added to the former Hotel des Orphelins, in the Rue St. Antoine, now incorporated with the Enfans Trouvés, by the buildings annexed to that establishment. The embellishments of the Place de la Concorde are advancing towards completion. The two fountains will soon be finished; and the reservoir for supplying them is forming near the Barrière de Monceaux, to which the water is to be brought from the Canal de l'Ourcq. The pavement of the Rue Vivienne is relaying on a new principle, and the curb-stones are bevelled on their under surfaces, so as to form covered channels for the passage of water—an improvement long since needed in that crowded thoroughfare.

Naples.—We learn by a letter that numerous ordinances have been lately published on education. The director of the university has directed that in future the first principles of physics, chemistry, mechanics, agriculture, and navigation, shall be taught in the elementary schools. No master is to take an apprentice until the latter has attended one of these shools for twelve months at the least. Special sciences are to be taught at the colleges, and normal schools are to be established.

Failure of a Suspension Bridge.—A new suspension bridge over the Dordogne, at Beaulieu, in the Correze, was tried a few days since, but gave way under the weight put upon it, owing to a defect in the supporting piers, and fell, with its whole mass of road-way and chains, into the river. Fortunately no lives were lost.

German Scientific Association.—At the last meeting at Friburg, on the 25th Sept., it was agreed that the next annual meeting should be held at Pyrmont. A proposal for holding it at Hanover was rejected by a large majority.

Itinerant Associations.—The French Geological Society, which recently assembled at Porentruy, and has been exploring the Jura, has been every where received with the greatest attention. The towns of Porentruy, Delemont, Soleure, Bienne, and other Swiss towns, have deputed scientific men to do the honours of the country to the society. [We think that our associations might follow this example, and that they would be much better employed in a week's organized exploration of Cornwall, or any other geological district, than in enjoying "the feast of reason and the flow of soul."—*Editor.*]

Turkish Canal.—A firman has been issued to construct a canal to join the Danube and the Black Sea, which would abridge, by several days, the transit to Constantinople, insure the liberty of the Danube, and render unavailable the possession of the Delta of that river by Russia.—*Augsburg Gazette.* This refers to re-opening the old canal of Trajan, between Rasova and Kostendsche, and would shorten the navigation of the Danube by eighty miles. It is confirmed by letters from Servia.

Egyptian Polytechnic School.—This school contains 225 pupils. They are maintained by the government, and receive pay according to the number of years of study. 1st year, 8*l.* per annum; 2nd year, 10*l.*; 3rd year, 12*l.*; 4th year, 14*l.*; 5th year, 16*l.*

Egyptian Gold Mines.—The gold mines recently discovered in upper Egypt have been exceedingly productive, and it is expected that others will shortly be discovered. A commercial house at Trieste has forwarded eighty quintals of Idria to Alexandria, to purify the ore.

MISCELLANEA.

An Antique Tomb has been recently discovered in piercing a railroad tunnel at Rive de Gier, near St. Etienne. It was cut in the rock, and lined with oak several inches thick, and covered with Roman tiles. The whole was in perfect preservation, and from its size was evidently intended for two persons. It is not stated whether any remains were found in it.

Ancient Relic.—About a year ago we noticed the removal of the old house in Queen-street, believed to have been the residence of Mary of Loraine. Various specimens of curiously carved work in the shape of oak panels were then taken down; and last week, in making some repairs upon the house adjoining, apparently forming part of the above building, a massive oak door was discovered, between the panels of which two black letter MSS. were found, which bear all the appearance, in the absence of dates, of belonging to the period when these residences were originally occupied. The curious in these matters may see them at our office for a few days.—*Scotsman.*

Several columns, capitals, and other Roman antiquities, have lately been discovered beneath the soil near Guignes, in the Seine at Marne. They are in good preservation; and as the spot on which they have been found is by the side of a Roman road, it is probable that further discoveries will be made.

Guildhall Statues of Queen Elizabeth, Edward VI., and Charles I.—The statues of Queen Elizabeth, Edward VI., and Charles I., which were discovered some time since in one of the cellars of Guildhall, having been thoroughly cleaned, they were yesterday morning placed in the three vacant niches at the east end of this magnificent hall. The statue of Queen Elizabeth is placed in the centre niche. The statues are in an excellent state of preservation, and will considerably add to the grandeur of this ancient edifice.

A new Railway Truck, the invention of Mr. Robert Grant, of Maine, is important to all connected with the construction and management of railroads and locomotives, if it actually possesses the recommendations enumerated. In the first place, the truck is guided by the carbody with such mathematical precision, that the wheels will, on a smooth plain, without rails, or flanges to the wheels, trace any curve of not less than seventeen feet radius to the eighth of an inch. They require no more power of draught on a curve than on a straight line, and will entirely do away with all lateral action on the straight track, thereby dispensing with one quarter of the force of traction in that case, and in passing a curve with one half. It is impossible to run them off the track after the locomotive has passed safe; they cost no more than other cars, will last as long again, and will not wear out the track more than one half as fast; they will be more easy, every way safer, and one quarter, if not one-third, of the expense of constructing and working railroads will be saved.—*New York Commercial Intelligencer.*

Steam Fuel.—An experiment has been made, on board the steamer on the Trinidad station, of pitch, as fuel: it was found to answer beyond expectation. She was two hours on her passage to La Bren, from St. Ferdinand, but accomplished the return voyage in one hour and thirty-five minutes. The pitch was said to leave little refuse, and not to run through the grating bars, the flame being much greater than with coal. [Qy. Is this pitch the Trinidad asphalte?—Ed.]

Tin Theatre.—Some of our contemporaries give an account of a novel kind of structure recently erected at Boston. It seems that our American brethren are not contented with tin and copper roofs, but that they must also use the same thin material for their floors. The greater part of the details of the house are executed in iron or tin plate; the machinery, the pit benches, the boxes, galleries, and even the platform of the stage. It is said that the plates give a more brilliant effect to the painting and decorations, and that they possess another superiority over linen and canvass, by increasing instead of deadening the sound of the voice. To prevent any inconvenience from the sound of footsteps on the hollow floors they are lined with woollen, and the whole edifice is represented as being, in addition, fire proof. The architect is said to have met with complete success, and some of the German periodicals look upon this attempt as an example which may be productive of most excellent results in their own country.

Some extensive traces of Roman edifices have been recently discovered in the forest of Arothone, near Caudebec, in Normandy, and among them, at a depth of four feet under the soil, the Mosaic pavement of a large chamber of extraordinary beauty. Upon some fragments of the side walls still existing, vestiges of painting in fresco have also been remarked.

OBITUARY.

We regret to announce the death of Mr. Timothy Bramah, of Pimlico, which event took place on the 21st ultimo.

We also have to announce the death of Dr. Bowditch, of Boston, United States, the translator of the celebrated work of the Marquis Les Place, "On the Mechanism of the Heavens." Four volumes of the translation had been published, and the fifth was nearly ready at the time of the Doctor's death. He lived to examine the last proof sheet of the work the day previously to his death.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH SEPTEMBER, AND THE 25TH OCTOBER, 1838.

JOHN WHITE, of Haddington, North Britain, Ironmonger, for "Certain Improvements in the Construction of Ovens and Heated Air Stoves."—27th September; 6 months.

JOHN BOURNE, of the City of Dublin, Engineer, for "Certain Improvements in Steam Engines, and in the Construction of Boilers, Furnaces, and Stoves."—8th October; 6 months.

JEHIEL FORBES NORTON, of Manchester, Merchant, for "Certain Improvements in Stoves and Furnaces, and in Instruments or Apparatus for making the same."—8th October; 6 months.

HENRY DUNIGTON, of Nottingham, Lace Manufacturer, for "Improvements in Warp Machinery and in Fabrics produced by Warp Machinery."—8th October, 6 months.

GEORGE HADEN, of Trowbridge, in the County of Wilts, Engineer, for "Improvements in the Manufacture of a Soap or Composition applicable to the Felting and other Purposes employed in the Manufacture of Woollen Cloth and other Purposes to which Soap is usually employed."—8th October; 6 months.

CHARLES SANDERSON, of Sheffield, Steel Manufacturer, for "A certain Improvement in the Art or Process of Smelting Iron Ores."—11th October: 6 months.

MATTHEW HEATH, of Furnival's Inn, in the City of London, Esquire, for "Improvements in Clarifying and Filtering Water, Beer, Wine, and other Liquids."—11th October; 6 months.

JOHN WOOLRICH, of Birmingham, Professor of Chemistry, for "An Improved Process for Manufacturing Carbonate of Lead, commonly called White Lead."—11th October; 6 months.

JOHN FOWLER, of Birmingham, Gentleman, for "Certain Improvements in Preparing or Manufacturing Sulphuric Acid."—11th October; 6 months.

WILLIAM BROCKEDON, of Queen's Square, in the County of Middlesex, Esquire, for "A Combination of known Materials forming a Substitute for Corks and Bungs."—17th October; 6 months.

HENRY MEYER, of Piccadilly, Wax Chandler and Oil Merchant, for "Improvements in the Manufacture of Lamps."—17th October; 6 months.

ELIAS ROBINSON HANDCOCK, of the City of Dublin, for "Improvements in Castor for Furniture and other Purposes."—17th October; 6 months.

GEORGE HARRISON, of Carlton House Terrace, Surveyor, for "Improvements for Supplying Air for Promoting and Supporting the Combustion of Fire in Close Stoves and Furnaces, and for Economizing Fuel therein."—17th October; 6 months.

WILLIAM EDWARD NEWTON, of 66, Chancery Lane, in the County of Middlesex, Patent Agent, for "Improvements in the Construction of Bridges, Viaducts, Piers, Roofs, Truss Girders, and Stays for Architectural Purposes."—17th October, 6 months.

JOHN GEORGE BODMER, of Manchester, Engineer, for "Certain Improvements in the Machinery or Apparatus for Carding, Drawing, Roving, and Spinning Cotton, Flax, Wool, Silk, and other Fibrous Substances."—22nd October; 6 months.

WILLIAM JUKES, of Great Russell-street, Bloomsbury, for "A Mode of applying Ventilating Apparatus to Stoves conducted on Dr. Arnott's Principle."—22nd October: 6 months.

WILLIAM EDWARD NEWTON, of 66, Chancery-lane, in the County of Middlesex, Mechanical Draftsman, for "An Improved Method or Methods of preparing certain Substances for the Preservation of Wood and other Materials used in the Construction and Fitting-up of Houses, Ships, and other Works, which Improvements are also applicable to other useful Purposes."—22nd October; 6 months.

JOHN HENFREY, of Weymouth-terrace, Shoreditch, Engineer and Machinist, for "Certain Improvements in the Manufacture of Hinges or Joints, and in the Machinery employed therein."—25th October; 6 months.

NOTICES TO CORRESPONDENTS.

We have been obliged to postpone "Ralph Redivivus," and several other communications, in consequence of their arriving too late in the month; likewise the notice of several works for the same cause.

The outline report of Wexford Harbour requires consideration. We should like to have a sketch of the Harbour and proposed improvements, also a full report of both parties.

We shall feel obliged to the Profession for accounts of Works in Progress, New Inventions, and Discoveries; it would be doing us a great service if our Country Subscribers will forward us any Newspaper connected with the objects of our Journal.

Subscribers are particularly requested to make up their sets of the Journal, as the First Volume will be completed with the December number, which will contain an index, title page, and introduction. In consequence of this additional matter, the December number will be charged sixpence *extra.*

Books for Review should be sent early in the Month—Communications on or before the 20th—and Advertisements on or before the 25th instant.

A MACHINE CALLED A HEDGEHOG.

FOR REMOVING MUD, &c., IN RIVERS.

(Communicated by S. Lewin, Esq., C.E., of Boston.)

The accompanying drawings exhibit a plan and section of a machine called a Hedgehog, used in Lincolnshire to assist in removing the mud, &c., that accumulate on the land side of the sea sluices. By reference to the plan and description its action will be easily understood, the wheel revolves on the centre, and is pulled backwards and forwards by means of tackle connected with it; it is applied when the water is running through the doors into the sea, and found to act very beneficially. When put in motion it is attached to the stern of a barge, which is drawn by horses; and sometimes a barge is moored at a certain distance from the sluice where it is intended to be used, having a mechanical purchase fixed in the same, and the machine moved backwards and forwards by means of leading blocks and chains. But there are various methods of using it, by attaching it to horses or to a steam boat, &c. The whole of the wood work is made of English oak.

Fig. 1. Plan.

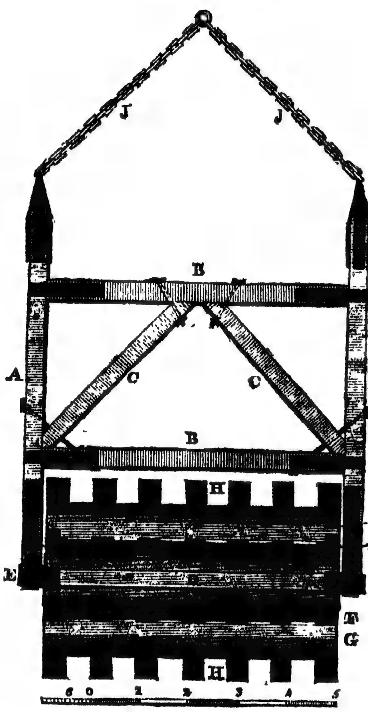


Fig. 2. Side Elevation of Frame.

Fig. 3. Transverse Section of Wheel and Spades.

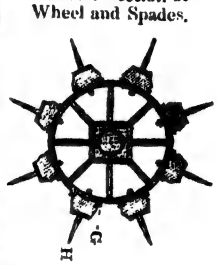


Fig. 4. Plan of Spades.

REFERENCE TO DRAWINGS.

Similar letters in each figure refer to similar parts.

A.A. Frame of timber, 6 by 4 inches, armed at the points with iron work, bolted through. B.B. Cross stays of timber, 6 by 4 inches, and 3 feet apart, connected to the frame by iron straps. C.C. Diagonal braces of timber, 6 by 4 inches, secured to the frame and stays by diagonal bolts. D. Shaft, of timber, 6 by 6 inches. E.E. Iron centres, upon which the wheel revolves. F. Iron work of wheel attached to shaft by iron arms, as shown in the section. G.G. Stocks of timber, 5 feet 11½ inches long, 6 by 3½ through which the iron spades are bolted to the iron wheel. H.H. Iron spades, 4 by 7 inches, placed 7 inches apart. J. Chain.

WOOD PAVEMENT.

MEMORANDUM ON PAVING STABLES. BY CAPTAIN ALDERSON, R. E.

(From the Papers of the Royal Engineers.)

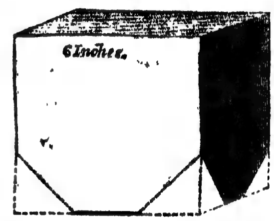
Constant repairs being required to the pebble paving of the stables at the cavalry barracks at the station (Brighton), and the usual mode of repair adopted, viz., relaying the pebbles in screened gravel, being found ineffectual, the following mode was resorted to with complete success.

The paving down the centre of the whole length of the stall, two feet in width, was taken up, and the ground excavated six inches deep throughout; a few half sovereigns, or six inch Purbeck stone pitchers, which happened to be at hand, were then placed on the part generally occupied by the fore and hind feet of the horse; the remainder was then filled in with concrete* to within one inch of the required level, and whilst the concrete was in a semi-fluid state, the pebble paving was relaid and rammed into it level with the half sovereigns, when the whole was grouted: it set in a couple of days, but was not occupied for ten. The pebble stones, thus firmly fixed in a matrix of concrete, are immoveable, and found to answer completely. The trial was on a sixteen stall stable. It has been constantly occupied since done without any complaint.

Laying paving or concrete foundation is of course not new, it is provided for in the schedules; but paving on it when in a semi-fluid state is so, as far as I know.

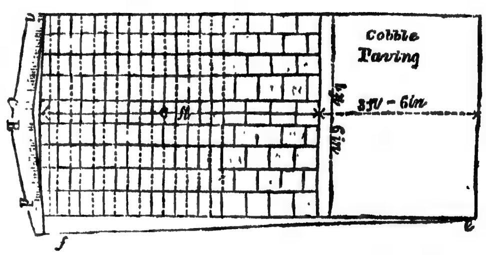
Though this appears to me the best mode that can be resorted to in pebble paving, I am of opinion that six inch yellow pine blocks Kyanized, placed on their ends diamond-wise on a bed of concrete, will be found both more economical as a paving, and infinitely better for the horses' feet and legs. I hope in a short time to be able to describe the best mode of laying these blocks: I am now trying different modes. I believe it is generally adopted in Russia, though I do not know either their dimensions or the mode adopted in laying them. My present idea is, that by taking off the lower angles at the four corners with an adze, so as to make the lower end octagonal, they may be laid like the pebbles in the concrete as a matrix.

Extract from Engineer Officers' Diary at Brighton, dated Jan. 3, 1838:—



"The wooden blocks for the pavement of the stalls in the stables are formed thus:—The upper surface being a square, and the lower an octagon, by taking off the lower corners with an axe; the blocks are then set in concrete from three to four inches in depth; they are set with mortar, and the pavement is grouted when set.

"The transverse grooves have answered most completely. They need not, I think, be made more than three or four feet from the rear upwards; that is, as far as it is ever likely the hind legs of the horse may stand, the fore leg being on the cobble pavement thus:—



"The dotted lines show the grooves, which are also made at the joints, making them every three inches. The course under the bail in each stall, and not shown, would be flat like the centre course at the stall, and this will make up the five feet to each stall.

"In consequence of the report that the stall laid with six-inch wooden blocks was found slippery, I was of opinion that transverse grooves, half an inch wide and deep, and three inches apart, would remove this complaint without destroying the principle. These grooves have been made, and by mistake longitudinal ones also: this I consider unnecessary; but several were done in the present instance before I was aware of it.

"The instrument by which this groove was made may be termed a bird's-mouth gouge, being a common gouge ground down.

"I consider the four-inch fall may be reduced one-half. The floor, it appears to me, will endure as long as the barrack, without once requiring repair: the size of the blocks may be regulated so as to accommodate the timber of which they are made; nor is it absolutely necessary that all the blocks be of the same size, so that *all* in the *same* course have one dimension, besides the depth the same: the depth should however, I think, never be less than six inches.

"R. ALDERSON, Captain Royal Engineers.

"Brighton, 11th September, 1837."

* The concrete was made in the manner usually adopted here in the sea-wall, as described by Lieut.-Colonel Reid, but without the pug-mill, viz.,

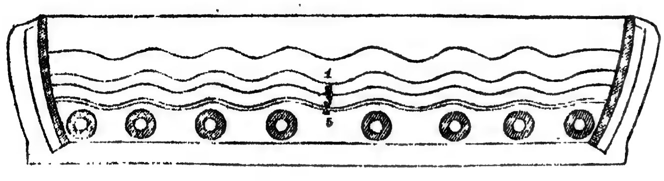
Part 1. Water lime slaked on the spot. 2. Fine sea sand, or gravel. 3. Shingle. The two latter ingredients are obtained from the beach; the former underneath, and the latter on the surface.

FILTRATION OF THAMES WATER AT THE CHELSEA WATERWORKS.

Communicated by Mr. James Simpson, Resident Engineer.

(From the Life of Thomas Telford.)

SECTION OF FILTERING BED.



REFERENCE.

1. Fine Sand.
2. Coarse Sand.
3. Pebbles and Shells.
4. Fine Gravel.
5. Large Gravel, containing the Brick Tunnels;—of which there are eleven under the Filter of the Chelsea Waterworks.

The process of filtering water on the extensive scale adopted at the Chelsea Waterworks being novel and interesting, as well as important, I am happy to communicate a general account of the success of the undertaking.

The managers of the Chelsea works had determined to prosecute some plan for rendering the quality of the water supplied by them unobjectionable; and in the spring of 1826 I commenced experiments and inquiries upon the subject, so that when Dr. Roget, Mr. Brand and Mr. Telford, the Commissioners of Inquiry, visited the works in the summer of 1828, they found the construction of filtering-works of some magnitude in an advanced state.

So little has been written on the subject of filtration of a practical nature, that the art of conducting the process upon a large scale was yet to be acquired, and improvements to be made upon the works at Glasgow, Manchester and other places, where it appeared that instances of failure, as well as of success, had occurred. Preliminary experiments were indispensable to warrant expenditure of capital on such works, and several trials were accordingly made on superficies exceeding one thousand square feet, to ascertain the most approved principle, and the fitness of the various materials proposed to be employed. All the modifications of lateral and ascending filters proved disadvantageous, difficulties were encountered in preserving the various strata in their assigned position, according to the sizes of their component particles; and effectual cleansing could not be accomplished without the removal of the whole mass of the filtering medium. All devices by currents, re-action of water, and other means, also proved either inefficient, or inconvenient and expensive.

The mode of filtration adopted at the Chelsea works is by descent, and the medium consists of fine and coarse river-sand, comminuted shells, and pebbles, and of small and large gravel. The materials are laid in a reservoir, their surface being disposed in ridges, which presents to the spectator an undulated appearance. The first experiments by descent failed; sufficient care had not been taken in the selection and separation of the materials. Explosions of condensed air in the tunnels for collecting the filtered water deranged the strata occasionally, and were obviated by air-drains. The filtration was, in one instance, stopped by the addition of fresh sand, without having previously removed the old sand, which should be applied as the upper stratum; although, in this case, the surface had been thoroughly cleansed previously, a film or puddle was formed on the original sand, and was sufficiently supported by the particles of sand to sustain five feet head of water, at first acting to impede, and eventually to stop the filtration. The process was greatly improved by the introduction of the small shells, such as are usually found at Shellness, the flat surfaces of which overlap, and assist in the great desideratum of separating the sand from the gravel, and thus tending to preserve the free percolation in the lower strata, which is essential for ensuring filtration sufficiently rapid for waterwork purposes.

The strata on the site of filtering-works, under the vegetable mould, consist of loam, sand and gravel, overlying the London clay to the depth of thirty feet. The sand and gravel contain powerful land springs, and the masses of ferruginous conglomerate they pass through are so great, that the water is of an objectionable quality; therefore, in constructing the basin to receive the filtering materials, it was necessary to exclude all the land water by clay and cement walling.

An excavation into the sand and gravel, of sufficient depth to admit of the water from the river flowing on to the filtering bed, would have involved too great an outlay; and this circumstance led to the construction of the basin, at a level which rendered pumping the water from the river unavoidable; but the consequent subsidence of the water, and the commandof a constant flow to the filtering-bed, are advantages which result from the expedient of pumping; and the interest of the money saved has more than compensated for the annual expense. The filtering-bed covers an area of one acre, and there is an elevated reservoir of nearly the same size. Reference to the accompanying sketch will explain the construction of the filter. The lower stratum of gravel contains the tunnels for collecting the filtered water. They are built with cement blocks, and partially open-jointed, two spaces of an inch and a half on the bed, and the heading-joint of each brick being open. The fine gravel, pebbles and shells, and the coarse and fine sand, are laid upon the large gravel.

The water is let on to the filtering bed at nine places, and the ends of the pipes are fitted with curved boards to diffuse the currents of water, and prevent the surface of the sand from being disturbed. The interstices in the fine sand being more minute than the subjacent strata, it is found that the impurities are arrested near the surface, and it has not been necessary to remove more than one inch depth of the sand at any one time of cleansing. This work is effected by scraping the surface every fortnight, and upon a careful examination it has been discovered that the sediment penetrates to the depth of from six to nine inches, according to the state of the Thames water; the greatest penetration occurring during the prevalence of land floods in the river. Notwithstanding this, however, it is not necessary to remove more than the depth stated, which contains the grosser impurities, the remainder tending rather to improve filtration by rendering the interstices between the particles of sand still more minute. From these observations it must not be inferred that the process is merely a fine mode of straining, for something more is evidently effected; an appearance resembling fermentation being discernible when the water is in contact with the sand.

The quantity of water filtered is from three to four thousand cubic feet daily' according to the demand. The undulated surface of the filtering-bed admits of parts of it being worked, and others drained; and it aids in cleansing, by admitting the grosser particles of the silt to slide down the ridges, and form a sediment easily manageable. The removal of the sand is effected by lifting portions of the fine sand in succession, and placing fresh sand of the same description underneath them.

REVIEWS.

A Bibliographical, Antiquarian and Picturesque Tour through the Northern Counties of England and in Scotland. By the Rev. T. F. Dibdin, D.D. With plates. 2 vols., large 8vo. London, 1838.

Dr. Thomas Frognall Dibdin is undoubtedly a first-rate coxcomb, a strange compound of black-letter pedantry and finical fiddle-faddle, singularly egotistical and pompous, yet clever and amusing: nor is he least of all amusing when he intends to be prodigiously sentimental or pathetic. One of his least excusable failings is his addiction to fulsome flattery and fawning; for his books exhibit more of the oiliness of the parasite then the unction of the divine, as these two volumes—perhaps we ought to say tomes—abundantly testify. With him every goose is a swan, if not absolutely a phœnix; and probably Mr. Emerson Charnly, of Newcastle, and Oliver Sumner, the bookbinder at York, stared not a little when they found themselves here recorded, the one as the "Veteran Emperor of Northumbrian booksellers," the other as a great "Bibliopegist Artist." However, we shall leave to others to notice the doctor's bibliomaniacal and bibliopegistical pursuits, contenting ourselves with culling from his "Tour" some scraps of architectural information, which we should have liked better had it not been so compressed and condensed. Some one of our correspondents therefore, we hope, will favour us with fuller particulars respecting the mansion of which the Doctor thus speaks:—

"On gently elevated ground, and about two miles from Grantham, we were struck with the rising Gothic glories of the residence of — Gregory, Esq. It is built on the Tudor plan of architecture, and no cost is spared for its continuance and completion in the most correct and splendid manner. I learnt that the drawing-room was one hundred feet in length; from the windows of which is seen Belvoir Castle, in all its pride and plentitude of effect. Mr. Gregory has the *rare* merit of being chiefly his own architect, with a thorough knowledge of the business in hand. Now and then, however, it is said that Mr. Blore whispers in his ear."

A drawing-room a hundred feet in length is certainly somewhat of a prodigy in these degenerate days, when the wealthy of the land ensconce themselves in coach-housed cottages; and if all the rest be upon a similar scale, Mr. G.'s house will be a magnificent affair. It is further to be hoped he is a Catholic, or else Welby Pugin will cut up his Gothic glories without compunction. With respect to the professional assistance Mr. G. has had, we know that although both Mr. Blore and Mr. Salvin have been employed by him, Mr. Burn, of Edinburgh, is the gentleman now engaged.

Respecting Belvoir Castle we are told, in a note,—

"The late Rev. Sir John Thoroton, chaplain to his Grace, was not only the principal architect of the exterior of the two sides of the castle, after the melancholy fire in 1816, but was also the planner of the greater part of the interior decoration. The destructive fire here alluded to burnt down two sides of the castle, which, with all the interior garniture, were not replaced under the sum of 90,000*l*. The pictures were necessarily an irreparable loss."

The paintings thus destroyed were upwards of one hundred, including, among other very fine ones, Reynolds's "Nativity."

Among the apartments are mentioned the "Regent's Gallery, a room of nearly one hundred and fifty feet in length, still left in an unfinished state;" and the dining-room, which "is sixty feet in length, with a ceiling (too low for such a length) most elaborately ornamented; though I wished the rosettes to have been gilded, and the high

relief to have been picked out in fawn or crimson colour." It is odd that the width of the room should not be stated, for it is that, and not its length, upon which justness of proportion as to height depends. Neither would it have been amiss to have informed us what the height actually is. We agree, however, with the Doctor, when he adds, immediately after, "a banqueting-room can scarcely be too gay or gorgeous." This maxim must be taken *cum grano salis;* for whatever may be the case in regard to a banqueting-room for state entertainments, a dining-room, even when sumptuous, should be in a somewhat more sedate and simple style then the drawing-rooms and boudoirs.

For the description of the Mausoleum at Belvoir, we must refer our readers to the book itself, merely saying that the building itself is by Benjamin Wyatt, and the statue of the late duchess and the children, by Matthew Wyatt.

Perhaps the Doctor is too apt to see every thing and every body quite *couleur de rose*, except, indeed, it be Mr. Britton; for though he refers two or three times to his account of York Cathedral, when speaking of that edifice, it is in the coldest manner, and without slipping in a single compliment, notwithstanding that he is so profuse of them to every one else, not forgetting another antiquary, of whom he says, "If the Minster (York) *must* crumble to dust, the glories of her architectural decorations will live for ever in the pages of Halfpenny!" Of compliments Mr. Richard Grainger, the Newcastle architect, has for one received his full *complement.* "It is difficult," says the Doctor, "to speak of extraordinary living merit without apparently transgressing the bounds of decorum, and even of truth. In the present instance the task is of yet more delicate execution; as the sensitive diffidence of this *Northumbrian Vitruvius* is apt to suggest the notion that offence may be felt where none is intended to be given. Away to the right and left with these flimsy and capricious phantoms! and let us contemplate this worthy and MIGHTY ARCHITECT as he deserves to be contemplated. His genius is his own, and vast as it is original. All the daring of the Roman mixes up in his achievements. He has a finger and thumb to span any space!" Really this is a pretty strong dose for the "sensitive diffidence" of Mr. Grainger, and we suspect that it was penned by the Doctor after his return from one of those "*symposia*" which he has registered with so much satisfaction of recollection. Passing over much that follows, and the whole of the newspaper account of the symposium given at the opening of the markets, October 22, 1835, on which occasion there were TWO THOUSAND GUESTS, we shall quote the following paragraph, as according better with our purpose:—

"Of the streets it were difficult to say which will preponderate—in width, length, and general splendour of architectural effect: but I learn that if the projected Grey-street—near which there is at this moment being erected a column 130 feet high, in honour of the illustrious nobleman whose name it bears—be carried into its meditated effect, it will be half a mile in length, and the width of Regent-street, with the difference (hear, and turn pale, ye Londoners!) of having the houses built of PORTLAND STONE. At present, what is just completed of *Upper Dean-street, Market-street, Clayton-street, Grainger-street, Pilgrim-street, Hood street, Nelson-street,* may be hailed only as the shadow of 'COMING EVENTS.'"

For our part, we only hope the Doctor is not mistaken—that he has not at all amplified what has been done, nor will prove to have been a too flattering prophet in regard to what is to be done. But we must say that the view of Grey-street, prefixed as the frontispiece to his first volume, renders us somewhat suspicious of him as to trustworthiness; for, unless it be strangely incorrect in itself, it fairly convicts him of misstatement, when he calls it as wide as Regent-street, for, according not only to the figures—and figures are, in such cases, far more likely to be diminished than exaggerated by a draughtsman —and also the size of the windows, the breadth of the street cannot be more than sixty feet. Nevertheless we do not find fault with it on that account, since the houses themselves thereby acquire comparative importance, whereas Regent-street is too wide for the height of the houses. The street at Newcastle has, it seems, the advantage of being built of Portland-stone—at least of stone, for that it should be Portland stone is not very probable; but then the buildings themselves are in a very flimsy and meretricious style of design—Regent-street at second hand—showy, common-place, without the slightest evidence of that originality for which the Doctor gives the architect such ample credit. There is not a single elevation—at least not among those shown in the view—that possesses the merit of any novelty whatever. Besides which, though there is no lack of Corinthian columns, a great many of the houses have very ordinary plain fronts, without any dressings whatever. To be sure the Doctor has very prudently confined himself to general praise, and had he done no more than commended the new streets and buildings at Newcastle as extensive and spirited undertakings and improvements, we could have agreed with him: not so when he launches out into a rhapsody of admiration so fulsome that it almost becomes irony. His own reputation, as a critic in matters of art, is not at all likely to be improved by his squandering away his admiration so freely. With this hint to him, and advising him to be far more chary of his praise for the future, if he would have any value attached to it, we now take our leave of the Doctor—for the present at least—as we shall probably return to him in our next number, and give some of his remarks on the architecture of Edinburgh and Glasgow.

The Steam Engine: its Invention and Progressive Improvements. An Investigation of its Principles and its Application to Navigation, Manufactures, and Railways. By THOMAS TREDGOLD, C.E. A New Edition, enlarged by the Contributions of Scientific Men, and extended to the Science of Naval Architecture. Edited by W. S. B. WOOLHOUSE, F.R.A.S. Vol. II. London: John Weale, 1838.

We have, on occasion of two reviews of the first volume of this work, availed ourselves of the opportunity of doing full honour to the memory of Tredgold, and of expressing our satisfaction with the compilation to which his name is attached. We feel pleasure, therefore, in seeing the conclusion of labours so happily begun, and so succesfully carried out, the more so as there is no period at which this second volume could appear more opportunely than at present. The aspect of political affairs gives a new interest to the subject of steam naval architecture, for a conflict must infallibly call into action, principles which may overturn all the established instruments of hostility, and give a new face to the science of warfare. Such an event would be important, not so much for its probable effects on the enemies of liberty and civilization, as for its influence on the state of war generally.

One of the main features of this second volume is steam naval architecture, and the treatment of it shows a correctness equal to the research employed. We regret, however, that on more than one occasion the Government has shown a narrow and self-injurious feeling, in refusing to submit to the conductors information on many points, which were important to the elucidation of their researches. We know of no motive beyond some petty office jobbing, which can be assigned for such a dereliction of duty to the national interests, for by the result of these labours the Government are more to be benefited than the profession, by whose exertions they are contributed. That the naval administration are desirous of keeping information for their own purposes, is a supposition gratuitously absurd, for by no outlay can they ensure the services of men of science sufficiently to keep all knowledge under their own control, or even as much as is exhibited in the work now before us. We trust, therefore, that on future occasions a better spirit will be manifested, and that it will be remembered that here, as in other departments of shipping, it is on the mercantile marine that the resources of war are founded. The Government seem well alive to the general importance of this arm of warfare, and while several of our dockyards are actively supplying new vessels, a general care has been taken to supply those already existing, with artillery of heavier calibre and wider range. We have little doubt that the shells of the new sixty-eight pounders will be found as formidable antagonists as the long-toms of sharp built cruisers, and that the old sailing vessels will be driven from the ocean, on which they will only be helpless victims to the range and weight of the wind-unembarrassed steamers. It is fortunate for us, that of all nations we shall feel the change of warfare least, for our boundless resources of iron and coal, and the skill of our workmen point out for us future security, beyond the present possession of the greatest tonnage of steam sea-going vessels.

Having expressed our sense of the service rendered to the nation by the information communicated on this department, our readers will perhaps feel desirous of examining some portions of a work abounding so highly in interest and instruction. The first portion is occupied with a description of the plates, which are exceedingly well executed, and confer great honour on the spirit and management of the publisher, being executed with a beauty and neatness which appear almost too finished for the low price of the work; while some of the wood cuts are of a magnificent size, without being subject to the reproach of unnecessarily occupying space. The descriptions are generally extremely clear and minute, particularly that of Stephenson's locomotive, the details of which are illustrated in the text by wood cuts, and so extensively elaborate, that an engine might be constructed from them. In the plates representing Maudslay's engine, at Chelsea Waterworks, this interesting subject is rendered defective from the omission of a ground plan of the machine; and we regret to say that such defect is too common in mechanical works, as if a ground plan were less necessary in this class of work than in architecture. In the extract which we subjoin we perceive an instance of sparring between the contributors, which seems to be carried on throughout the work, and tends to diminish our dependence on the result of their exertions.

The American contributor, among others, suffers from this inhospitality. There are three papers on paddle-wheels, and the disjointed effect of their labours is, that Barlow is attacked by Mornay, and this last again by the Editor; while the reader is left at the end of the conflict to decide on which he will not believe. We deprecate this puerility, it is unworthy of the work, it is derogatory from the cause of science, and it is particularly ungracious and impolitic towards a member of a kindred nation, which, if weak, we ought to support rather than to abase. We call the attention of the editor to these circumstances, to remind him that, however well he may have done his duty as a man of science, there is a minor degree of acquirement, which ought always to maintain a due degree of courtesy among the learned, and secure for them that respect from the world, which to maintain they must show towards each other. Our readers will perceive something of the nature of this rivalry in the description which we now extract of the Ruby steam boat.

ENGINES OF THE GRAVESEND PACKET RUBY.

This celebrated vessel, undoubtedly the fastest in Europe, and perhaps in the world, was built by Mr. Wallis, of Blackwall, near London, in the year 1836, from the designs and specifications of Mr. O. Lang, jun., of her Majesty's Dockyard, Woolwich. The engines were made by Messrs. Seawards and Co., of the Canal Iron Works, near London.

The very great success of this vessel, she having beaten all competitors from the time of her starting to the present, may be attributed to two principal causes:—

First, to a most judicious arrangement in the form and construction of the vessel, by which the quantity of materials used in the building are brought so to bear upon one another, that each piece performs the office assigned to it; and no more timber is used than what is requisite to give the ship the necessary strength and solidity. From the method of planking which is adopted, consisting of three thicknesses of oak placed diagonally and longitudinally, the vessel is completely trussed from end to end, and at once combines strength and lightness in an eminent manner. The length of the Ruby is 155 feet between the perpendiculars, 19 feet beam, and 9 feet 6 inches depth of hold; she will carry with ease 800 passengers. When launched she drew about two feet of water. Her after-cabin is 33 feet long, and will dine 100 passengers; the ladies' cabin is about 15 feet long, and the fore-cabin 33 feet.

Secondly, her superiority is attributable to her engines, which consist of two fifty-horse power engines (100-horse power the two), in the making and fixing of which every care was taken to have them as light and efficient as possible, without endangering their stability; and the calculation of weights and of displacement was so nicely adjusted, that when the whole of the weights were on board, and the vessel equipped for service, her real draught of water, 4 feet fore end and 4 feet 6 inches aft, was within a quarter of an inch of the builder's estimate. The weight of the engines complete with the water in the boiler is exactly 90 tons 5 cwt., being about 18 cwt. to the horse power; the diameter of the cylinder is 40 inches; length of stroke, 3 feet 6 inches; diameter of outer edge of paddle-wheel, 17 feet; and length of board, 9 feet 3 inches, and width 15 inches; with a dip of 17 inches with 200 passengers on board: then the speed of the engines is 30 strokes per minute, the pressure of the steam being only 3½lbs. above the atmosphere. The speed of the piston is therefore 210 feet per minute, the speed of the outer edge of the paddle board is nearly 20 miles per hour, and the speed of the vessel through still water by repeated trials is exactly 13½ miles per hour.

It is a remarkable fact, that from the first day of trial up to the present time, this boat has not varied her speed one-twelfth of a mile per hour; she has neither increased nor lost her speed. This is mostly to be attributed to the fact of the engines being in a most perfect state when set to work, but more particularly to the use of the patent slide valves on board of this vessel, and which after two years' working have been found as perfect upon their faces as when first put together; a further proof of their superior working is evinced by the vacuum in the condensers of the engines having never varied one-fourth of an inch, remaining constantly between 28¼ and 28½. This is ascertained by barometers attached to each engine, which are not affected by the atmosphere, and makes the vacuum as perfect as possible; for supposing the waste water, as it leaves the condenser, to have a temperature of 110 deg., which is equal to 1½ inch of mercury (see Professor Robinson's experiments), when added to 28¼ it gives 29¾, the usual height of the marine barometer in fine weather.

The safety valves are arranged upon the plan invented and used by Messrs. Boulton and Watt a long time since, and now generally adopted by the engineers of London. They are so arranged that no one on board can possibly have access to them; the engine man can at pleasure open them and let the steam escape, but he has no means by which he can keep them down, beyond the weight placed upon them by the engine maker, which weight is, as before stated, 3½lbs. on the inch; and it is a curious fact, that this boat has attained the great speed named, with this small pressure, while in a variety of instances vessels from different outports, working with high-pressure steam, and with the safety valves loaded *ad libitum* by the engineers and captains, have never been able to approach her in speed. This clearly proves, what the late Mr. Watt demonstrated long ago, that the most efficient, safe, and economical mode of working steam engines for marine purposes is at a pressure of from 2½ to 3½lbs. on the inch. At the same time, for single acting pumping engines there is no doubt an advantage gained by the judicious use of high pressure steam, say of 30lbs. on the inch, working expansively, with boilers properly constructed; but which boilers, for many reasons, are not at all fit for steam vessels: in fact, almost all the melancholy accidents that have lately occurred to steam boats by the explosion of their boilers, have been caused by the injudicious application of high pressure boilers to marine purposes.

It is here worthy of remark, that the Americans, who claim to propel their vessels at the high speeds of 15, 16, and in some cases 18 miles per hour (which, by-the-by, has been amply contradicted in this work by an able American writer, who states the greatest speed through still water attained by the best American steamers, he believes to be in one instance 14 miles per hour, but that the rest of the New York boats do not come up to this), state that the principal cause of their alleged triumphs is owing to the use of high pressure steam, used expansively; the causing the pistons of very long stroke engines to move at the rate of 300, 400, and sometimes 600 feet per minute; and lastly, to the superior form of the bows of their steamers, which are built so as to glide over the water instead of cutting through it.

In the case of the Ruby, in all these important matters she is decidedly the reverse of the Americans; the piston only travels about 210 feet per minute, very low pressure steam is used, the stroke of the engines is very short, being only two inches more than the diameter of the cylinder, and the form of the bow is decidedly that which will cut or divide the water without the least tendency to ride over it, inasmuch as this vessel's bow is shaped like a knife being as long on the keel as at the water's edge within two feet.

Judging from these facts, it will be seen that high pressure steam, length of stroke, and prow-shaped bows, qualities so loudly extolled by the Americans, are not all necessary for speed, but, on the contrary, the first two are positive nuisances; the length of stroke rendering the vessel an unwieldy, ill-contrived machine, totally useless for the purposes of sea navigation, as events have proved; while the high pressure steam system has been the means of filling the journals with those ever-occurring, heart-rending, and sickening details of hundreds and thousands that are being yearly sacrificed to ignorance and prejudice, by attempting to do that by the dangerous use of high pressure steam which can be so well effected by steam of a low pressure, and that too at one half the consumption of fuel.

The limits of this paper will not permit the writer to digress upon the subject of consumption of fuel, except by stating, that in no instance has the use of high pressure steam applied to an engine for rotary purposes ever been attended with economy of fuel, but the reverse; and it is not a little singular, that in this age, even in this year, northern engineers are imitating the Americans, by the use of the long stroke and high pressure steam, in the Thames, which one would think might have been spared this pestiferous curse. The results have been, and are, that the short stroke engines are propelling the boats, both sea and river class, faster than the long stroke ones. This length of stroke has been obtained by the placing of one half the machinery upon deck, some 12 or 14 feet high, and thus making the vessel frightfully crank and most unseemly to look at, while in vessels going head to wind, it exposes some hundreds of square feet of surface to be acted upon as a back sail.

The great danger of high pressure steam will be evident to every one, when it is recollected that within the last three years three different vessels have had dreadful explosions, viz., two on the Thames and one at Greenock (besides some less fatal ones in different parts of the north), by which more lives have been sacrificed to the Moloch of high pressure steam, than has ever occurred with low pressure steam during the whole progress of steam navigation, extending now almost to a period of forty years, and in the course of which nearly 3,000 steam vessels have been fitted out and successfully worked.

We have not room to extract farther from the extensive series of descriptions, but we refer the reader to the work, where he will find all necessary information respecting steam boats and locomotive engines.

The second volume proper begins with the sixth paper of the Appendix, which is by Professor Renwick, on the steam boats of the United States. We select from this interesting communication the portion explanatory of the superior speed of American vessels, which is the subject of the comments of the previous extract.

The writer made, in the "New Philadelphia," one of the most remarkable passages ever performed. Leaving New York at five o'clock P.M., with the first of the flood, he landed at Catskill, distant 111 miles, a quarter of an hour before midnight. As passengers were landed and taken in at seven intermediate points, the rate at which the passage was performed was not less than 18 English miles per hour. Now, as the current in no case exceeds 4 miles per hour, the absolute velocity through the water must have been at least 14 miles.

In obtaining these velocities of thirteen miles and upwards per hour, it does not appear that the force of the engines employed exceeded that which had been used in some American vessels which had far less speed. Neither was the relation of the power of the engine, estimated in the usual manner, to the tonnage of the vessel, greater than that found in European steamers, whose velocity does not appear, at that time, to have exceeded 10 miles per hour. Besides, it cannot be denied that the advantage in the finish and workmanship of the engines was on the side of the European vessels. We may therefore inquire to what circumstances it was owing, that a rate of speed, which a high British authority has very recently declared to be incredible, should be actually obtained. We ascribe this chiefly to the great difference in the principles which governed the structure of the engines in the two different countries. In the modifications of the original form of the engine of Fulton, the English engineers, whose efforts were principally directed to the navigation of stormy seas, thought it indispensable that the machinery should be included beneath the deck of the vessel. The stroke of the piston and the length of the crank

were therefore diminished below the proportion originally chosen by Watt. In America, the vessels being principally intended for the navigation of rivers, no such change occurred; and when it became necessary to make the "New Philadelphia" compete with vessels driven by more powerful engines, Stevens increased the length of the stroke and of the crank. The new relation between the diameter and length of the cylinder thus obtained, was followed, or even exceeded, in all subsequent engines. No change was made in the dimensions of the boiler, but the additional force was obtained by causing the steam to act expansively. The latter method was attended by an anomaly, which is however readily explained, when it is considered that the relative velocity of the circumference of the wheel is constant. It was not found that the steam, although cut off, at first at half stroke, was much increased in tension. The most obvious effect of the method was an increase in the velocity of the piston, by which the steam was prevented from accumulating.

When we consider the wheel as a body revolving on an axis, and which meets with a resistance, whose resultant is applied to a point at no great distance from its circumference, it will be obvious that there will be a point, to which, if the crank be applied, the whole force of the engine will be exerted to overcome the resistance; but if the crank be applied to any other point, a part of the force will be wasted upon the axle itself. Now, even in the long stroke usual in the modern American engines, it does not appear that the crank extends as far as this most favourable point; but in the short stroke of the English engines a large proportion of the whole power is lost.* This advantage is, however, at present less sensible in the American steam boats; for the principle of using cylinders of great length having been introduced, the next step was to increase the diameters of the wheels. The object intended to be gained by the latter change was an increase in the velocity of the circumference of the wheel, for the constructors of steam boats seem to have reached the conclusion that every addition to this velocity would add as much to that of the vessel. In one instance the diameter of the water wheels has been increased to 30 feet, and the stroke of the piston to 12 feet.

As an additional means of obtaining high velocities in the piston, the dimensions of the valves and steam pipes of the American engines have been increased beyond the proportion used by Watt. The flow of the steam from the boiler is thus rendered more rapid, and the velocity of the piston increased in like degree. We have already stated that the steam is cut off, and thus caused to act expansively: the advantage thus obtained is analagous to that derived from the same method in the pumping engines of Cornwall.

As an accessory, and one of no little importance, we may mention the form of paddle wheel originally introduced by the younger Stevens, but now universally adopted. The form of this may be readily understood, by supposing a common paddle wheel to be cut into three parts, by planes perpendicular to its axis; that one of these being supposed to remain at rest, the second is moved through one-third, and the third part through two-thirds of the space intervening between two contiguous paddles.

The triple wheel of Stevens does away the principal objection which can be opposed to the common paddle wheel, namely, the long interval between the successive strokes of the wheel against the water, and their violence.

In vessels of small dimensions the same principle is applied, but the wheel is only double, instead of being triple.

The velocity of the pistons of engines used for manufacturing purposes is about 200 feet per second. In the "North America" this velocity was carried up to 384 feet, and the rate is now exceeded in many of the newer vessels. Thus, in the steam frigate "Fulton," the velocity of the piston is 450 feet, and in the "Cornelius Vanderbitt" and "Highlander," as much as 600 feet per second.

The professor thus speaks of the defects of the American vessels :—

One prominent mistake, however, appears to have been committed in the vessels recently constructed for the navigation of the ocean in the United States. Departing from the practice, which had become sanctioned by successful usage, of employing two engines placed upon the wheel guards, a single one has been substituted.

The use of a single vertical engine of long stroke is attended with another difficulty, namely, that it requires a large opening to be left in the deck of the vessel, which cannot be sufficiently defended from the influx of the sea; for the bulkheads which surround it, cannot be rendered strong enough to resist a violent wave.

After all, the main objection to the present model of American steam boats, when considered in their fitness for the navigation of the ocean, is the weakness inherent in the great proportion which their length bears to their breadth and depth.

The following is an account given by Mr. Renwick of a vessel, which has been some months in preparation in the port of New York, for the purpose of running between that city and Liverpool :—

In this vessel a new form of boiler has been introduced, the principle of whose action is, that the combustion shall be maintained by air forced into a furnace without a chimney, and that the air, after acquiring, by the joint effect of compression and elevated temperature, a tension equal to that of the steam, shall open a valve by which it may join the steam in its passage to the valves of the engine. A sufficient number of experiments have been performed with this boiler, to show that it will produce a given effect at a vast saving of fuel, but various practical difficulties seem to oppose its perfect success.

* The author must here allude to the friction caused by the pressure on the shaft: no loss of power can otherwise result from the mechanical arrangement.—*Editor of Tredgold's Steam Engine.*

The conclusion of the Professor's remarks exhibit a spirit of candour which we should have liked to have seen manifested towards him :—

In conclusion it may be stated, that in respect to speed the steam boats of the Hudson exceed any others, have attained a velocity which is hardly believed to be possible in Europe, and are for the navigation of rivers unequalled. The same principles, modified according to the circumstances of the case, may be applied to give a greater velocity to vessels intended for the navigation of the ocean than has yet been attained by the English steamers. On the other hand, the vessels constructed in the United States for speed, want some of the essential properties of good sea boats. In the competition and honourable rivalry between the engineers and naval architects of the two countries, which the voyage of the "Great Western" is likely to call forth, the advantages of the methods which difference of circumstances has brought into use in England and the United States will probably be combined. We may therefore hope to see the rapid motion of the American vessels planned for river navigations, united with the strength, safety, and sea-worthy qualities of the British steamers.

The seventh paper is one of those previously mentioned on paddle-wheels, by Mr. Mornay, who, in an elaborate comparison of the several varieties, appears to prefer Morgan's improvement. We perceive, by-the-by, in the "United Service Magazine," a statement of a recent failure of paddle-wheels in H. M. steamer Megera, the particulars of which will be found in another part of the journal.

The eighth paper is on "Watt's Indicator," and the ninth on "Howard's method of Vaporization." The tenth paper is an able essay on the "General Theory of the Steam Engine," by the editor, and containing, among much other interesting matter, some remarks on rotatory engines.

The eleventh, similarly, by the editor, under the title of "Rules for calculating the Steam Engine," gives a complete system of practical steam arithmetic. Among many interesting objects, we find that the following extract will give the most available specimen of the treatment of the subject :—

POWER.

To find the power of an engine.

RULE.—Multiply double the length of stroke by the number of strokes per minute, and we get the velocity of the piston per minute.

If the engine works expansively, the mean effective pressure must be found by the previous rules.

Multiply the square of the cylinder's diameter in inches by the mean effective pressure on the piston in lbs. per square inch, and by the velocity of the piston; point off three figures and divide the product by 42, and the quotient will express the number of horses' power.

We have thus gone through the volume; but although we trust we have done full justice to it, we must refer the reader to the book itself to obtain a clear idea of its value. The greatness of such a work is a plea against hypercriticism, while the remarks which we have made will assure every one that we pay an honest tribute to the publisher and the editor when we assert, that it does as much credit to the public spirit of the one, as to the scientific acquirements of the other.

Transactions of the Institution of Civil Engineers. Second Volume. London: Weale, 1838.

The profession of civil engineering as a branch distinct from architecture dates only from a late period, and is one of those results of division of labour consequent upon our social progress. The idea of its association with architecture at any period, rested always upon a misconceived basis, for although it be true that in many instances both classes of professors operate upon the same materials, yet such circumstance by no means necessitates a bond of union; but may rather tend to show the distinctness of purpose. It is by confounding the architect with the builder and the mason, it is by this mingling of the operations of mind with those of matter, that we are often left in hesitation whether we should class a work as of architecture or of engineering. The professions have a connection in some studies, and may even in some cases pursue the same operations; but such facts no more tend to establish an intimate and indissoluble union, than the mutual study of medical jurisprudence to assimilate surgery and law. This division of pursuits has doubtless contributed no less to the mental progress than to the mechanical proficiency of the two classes; for if architects have more to deal with what is beautiful, so, on the other hand, engineers have greater scope in the colossal and sublime. If one be the lyric poet, the other is the epic, of the constructive arts; and it may be questioned whether an architect would attribute equal glories to the pyramids of Egypt, as to the basilica of St. Peter's or St. Paul's Cathedral. In the periods of the works of Sir Christopher Wren, the old bridges on the river, or the wall and terrace of Somerset House, we perceive little distinction made between the two professions; nor perhaps did an effective separation take place until the epoch of the great mania for canals,

at the end of the last century, which raged with a fury equal to that for railways in the present day. As it is, the result must necessarily be in the development of public works, that a still farther ramification must take place, and necessarily promote the improvement of engineering. What, indeed, can be a greater anomaly, than to expect a similar success from the same man in works so dissimilar as roads, bridges, and harbours? It is not that great minds may have succeeded equally in all branches, but that little minds, the staple of the world, must fail. It is not the universality of a Homer, a Shakspeare, or a Milton which denies, but, on the contrary, by exception confirms the rule. But to justify their independence, the profession must not, like lawyers, live only on old precedents; but, by the exertions of their inventive faculties, vindicate their claims to genius and their standing in the learned world. They must remember that they belong to a body which in modern times has produced Smeaton, Brindley, Rennie, and Telford, not to speak of its mechanical members, and which has most powerfully contributed to civilization by annihilating space and vanquishing the elements; which has thrown into the shade powers confirmed for tens of centuries, surpassed the fleetness of the horse on land, and placed us beyond the caprice of wind upon the ocean.

Among the features most worthy of interest in the career of engineering, are the joint contributions of the constituted body of its members, for it is to this volume that men of science will naturally have recourse, to ascertain how far the mental progress of the profession is commensurate with the just expectations of the public. We feel happy, therefore, in witnessing that this record shows a spirit of research and ability fully satisfactory, and particularly when we consider that the leading members of such an active profession, like general officers in a campaign, have little opportunity to register their opinions but by their works. In the volume now before us, the distribution of the subjects necessarily preventing any general view being taken of it, we must, on the present occasion, glance at the contents, and reserve for a future period a more discriminating examination of its parts.

The first paper is an Account of the Bridge over the Severn, near the town of Tewkesbury, designed by Telford, and communicated by W. Mackenzie, M. Inst. C. E., with three plates of the bridge and details. We know that the works of Telford are considered by many of the profession as good precedents, and undoubtedly in many cases very properly so; but we should wish them to observe, that too frequently the grandeur of the main feature of his designs is frittered away by the pettiness of its accompaniments. Telford had no eye for effect, but, having dashed out a leading object, he left all the rest to fate, and the consequence is that there is hardly one of his designs that we can recommend as a whole, for they look too often like colossal Gothic works, disfigured by the additions of an inferior artist. In the instance now before us, although it is a work of great merit, we regret to see it so much degraded by inattention. To the single arch of 170 feet span, and 16 feet 6 inches rise or versed sine, there is appended a collection of most incongruous and inappropriate lancet-shaped land-arches; and although there is great merit in the main arch and its details, yet these disfigurements make it look like a superior picture in a frame of ubbish.

Paper II. is *a Series of Experiments on different Kinds of American Timber, by W. Denison, Lieut. Royal Engineers, &c.* The author states that his object in making these experiments was twofold; in the first place, to establish some proportion between the strength of different kinds of American timber, and then to reduce them to a common standard, by reference to Mr. Barlow's experiments on European timber, so as to enable him to supply the place of the constant factors, which enter into the rules or formulæ by which the dimensions of timber for different purposes may be calculated with some degree of correctness; and in the second place, to ascertain the difference, both in dimension and strength, made by seasoning, or by difference of age, or position in the tree. The author then proceeds to detail the manner in which he made the experiments, and gives the result in a table, containing the details of 91 experiments, which were principally made on pieces of wood 24 inches long and about an inch square. This is a laudable object, but we wish we could se a series of experiments made upon a more enlarged scale than upon these bits of match wood, for the results produced, we fear would be wofully different. The Institution would do well were they to vote a sum of money for performing a series of experiments on an extensive scale, such as upon battens, deals, planks, and timber from 5 feet to 20 feet in length, and of different countries. Here we should have something tangible and practicable, something on which the practical man might place dependence.

Paper III. is *on the Application of Steam as a Moving Power; considered especially with reference to the Economy of Atmospherical and High Pressure Steam, by George Holworthy Palmer, M. Inst. C. E.* In this paper the author affects to regard with astonishment the official returns of the duty of 10 or 12 of the Cornish engines, and attempts to prove the impossibility of their performing any thing like the duty which they are reported to execute. His deliberate opinion, he states, is "founded on theoretical (?) and practical experience;" but he does not adduce one practical instance relating to a Cornish engine to support his theory; and to prove the assertions of the opposite party, Mr. Palmer winds up his paper with the following:—

Upon what principle, then, permit me to ask, can the Cornish engines perform so much more duty than all the other engines. Strong, indeed, should be the evidence that ought to outweigh or cancel the foregoing laws of nature, and induce this Institution to sanction statements of duty more than double that of the best Watt engine, and still more, surpassing the limits Nature has assigned steam to perform (under circumstances over which man has no control, the atmospheric pressure), unless, as before premised, the Cornish engineers can convert, with 7lbs. of coal, more than 62½lbs. of water from 40 deg. F. to atmospheric steam; and unless highly elastic steam can be applied as a first mover without converting sensible into latent caloric.

Really this language is not very complimentary to Captain Lean, Mr. Taylor, Mr. Henwood, Mr. Wicksteed, and others, whose evidence does not seem to be sufficient for Mr. Palmer; but we trust the practical experiments made by Mr. Wicksteed in Cornwall, and related by him in the present volume, will soon be put to the test in London, for the satisfaction of Mr. Palmer and his anti-Cornish engine associates.

A steam engine, with a cylinder eighty inches in diameter, is nearly completed at the East London Water-works, and in few days Mr. Wicksteed will have a practical opportunity of dispelling the theoretical mist from the eyes of his adversaries, who cannot see the difference in working of a steam engine with its boilers, pipes, and cylinders well clothed, to prevent the loss of heat by radiation; nor are they aware of the difference in the construction of boiler furnaces, the manner of feeding them, the qualities of coal, and many other accessaries, each of which makes important differences in the consumption of fuel; and their combined effect, no doubt, will account for the vast difference in the cost of working different steam engines.

Paper IV. is *a Description of Mr. Henry Guy's Method of giving a true spherical Figure to Balls of Metal, Glass, Agate, or other Hard Substances*, which paper we shall notice on a future occasion.

Paper V. is *on the Expansive Action of Steam in some of the Pumping Engines in the Cornish Mines, by W. Jory Henwood*, of which paper an outline was given in Journal No. 7, page 169. Appended to it are several tables, showing the proportions of the engines, and the quantity of fuel consumed. The author gives the following as

The work accomplished for a certain expense.—The foregoing details supply all that is requisite for this inquiry, except the prices of the materials consumed; these were coal, at the rate of forty one shillings for seventy two measured bushels; grease, forty-five shillings and sixpence per 112lbs.; and oil, four shillings and two pence per gallon; at which rates the results

Huel Towan, Wilson's engine, 1085 tons;
Binner Downs, Swan's engine, 1006 tons;
East Crinnis, Hudson's engine, 870 tons;

lifted one foot high for the expense of one farthing.

Paper VI., *on the Effective Power of the High Pressure Expansive Engines in use at some of the Cornish Mines, by Thomas Wickstead, M. Inst. C. E.*, we have given at full length in another part of our Journal. At a period when there is so much controversy and doubt regarding the economical working of Cornish engines, this paper will be read with great interest, and the more so as Mr. Wicksteed is quite unconnected with any party in Cornwall. Being engaged professionally, and having a responsible duty to perform on behalf of the company of which he is the engineer, he took every reasonable precaution in managing the experiments, and obtaining correct results, which proved perfectly satisfactory, and confirmed the previous reports which had been made. This report led to that company purchasing an engine belonging to the East Cornwall Silver Mining Company, which has been removed to London, and erected at the East London Waterworks, Old Ford. It is expected to be completed in a few days, we hope to be able to give a full account of its performance in our next number.

Paper VII. contains *a Description of the Drops used by the Stanhope and Tyne Railroad Company for the Shipment of Coals at South Shields, by Thomas E. Harrison, M. Inst. C.E.*, accompanied with drawings and working details of the construction. This machine, if we may so call it, may be easily and advantageously adapted for railways, when the stations and depots are considerably above or below the

common roadways, as possesses considerable ingenuity in its construction, and appears to be well adapted for the purposes to which it is applied.

The mode of shipping coals, shown by the drawings, was made the subject of a patent by the late William Chapman, of Newcastle-upon-Tyne, in the year 1807, and it is one of those instances in which the patentee, either from prejudice or some other cause, received little remuneration for an invention which has been the means of saving thousands to the coal owners on both the rivers Tyne and Wear; for although it was almost entirely neglected during the continuance of the patent, it shortly afterwards came rapidly into extensive general use. *

Previous to the introduction of the plan now generally adopted, coals were chiefly transferred by waggons from the various collieries to the river, where they were put into keels or barges, the bottom of the waggon being let out, and the coals running down a spout or guide to the keel; in these keels they were conveyed down the river to the vessels, and cast by the keelmen into the hold of the vessel.

From these various operations and transhipments the coals received much damage by breakage, and the attendant expense was also considerable. The same system is, however, in use in some collieries at the present day; but from the various railways now in progress, which will bring all the coal to parts of the rivers at which they can be shipped at once into the vessels, there is little doubt but that in a few years a keel will hardly be known upon either the river Tyne or Wear.

During the year 1837, the quantity of coals shipped from the north of England was as follows: from Newcastle 2,868,651 tons, Sunderland 1,174,598 tons, and from the port of Stockton 1,192,353 tons, making in the whole 5,235,602 tons; of which it may be calculated that at least three fourths are shipped by means of drops varying considerably in arrangement of the machinery, but all upon the principle of the original patent.

The advantages of the plan are, that it avoids considerable breakage to the coals, as the waggon is lowered down to the level of the deck of the vessel, and the coal has much less height to fall; that by arranging the length of the vibrating or falling frame according to the situation, a vessel may lie in deep water at a distance from the quay and receive her cargo; and that the whole machine being self acting, the expense of shipment is very trifling. * *

The cost of one of these drops, including all machinery, timber, and iron work, but exclusive of masonry and gangway, is about 500*l*. Great steadiness is given to the machinery by two heavy piers of masonry, the four main legs (upon which the whole of the superstructure rests) being half let into them, and firmly bolted together by strong bolts running through them.

The great length of the vibrating frames enables vessels to receive their cargoes at these staiths, whilst lying in a depth of water varying from thirteen to sixteen feet (at the different drops) at low water of a spring tide.

One of these drops is capable of shipping one Newcastle chaldron of coals of fifty-three cwt. every minute, but this is never required in practice, as the coals cannot be trimmed in the ships so fast, the usual work being from twenty-five to thirty-five chaldrons per hour.

Paper VIII. is *on the Principle and Construction of Railways of Continuous Bearing, by John Reynolds, A. Inst. C. E.* The author describes the advantages of his patent rail, and compares its cost with other rails; time and experiments, however, are the only tests of superiority. A length of the patent rail has been laid down on the Great Western Railway, but we have not yet heard whether the result of the experiment has proved successful or not.

Paper IX. describes a *Wooden Bridge over the River Calder at Merfield, Yorkshire, designed and erected by William Butt, A. Inst. C. E.* Simplicity and cheapness in the construction constitute its great recommendation. The span of the bridge is 147ft. 6in., and 11 feet rise; the roadway is 5 feet wide in the centre, and 8 feet at each end; its cost was under 500*l*.

Paper X. is *on the Teeth of Wheels, by Professor Willis.* The simplicity to which the professor has reduced the method of setting out the teeth of wheels will be both useful and valuable to the millwrights. We shall, very probably, be induced to examine this paper on some other opportunity; as, to do it justice, it would require more space and time than the lengthened extracts we have already given on other papers would enable us to spare.

Paper XI. contains *a Series of Experiments on the Strength of Cast Iron, by Francis Bramah, M. Inst. C. E.*, and describes a series of 29 experiments on cast iron, very carefully performed on various sections; the rectangular, the T form, the T reversed, the open rectangular, open T, and the triangular; the general length of the specimens was 3ft. 1in. in the clear of the bearings, and they weighed from 15 to 22 pounds each. The whole of the experiments made were very satisfactory, and fully proved the importance and value of Tredgold's formulæ. Mr. Bramah observes—

That the extent of the elastic power of the material is the limit of practical strength there can be no doubt, for as soon as the applied force exceeds that amount, the tenacity of the material becomes sensibly impaired, and the injury increases rapidly as the point of fracture is approached. The coincidence of the two forces, extension and compression, to produce equal effects when confined within the limit of elasticity is very striking, and their divergency after passing that point is equally remarkable. * *

It is a striking feature in these experiments, that the results not only accord most minutely with the theoretical deductions of Tredgold, but that they show most completely that the aggregation of the particles of the metal, whether in the smaller or enlarged sections, is nearly the same; since in beams of the largest kind weighing from four to five tons and upwards, and constructed to sustain a load of from 50 to 150 tons weight, the same degree of fidelity attends the comparison. It is very important to know this, for in work of such extensive requisition as Tredgold's essay on cast iron, to have a doubt existing of its accuracy in theoretical or practical detail is to involve the practitioner in the most painful perplexity. It is also a source of the highest gratification to be enabled upon this positive testimony to conduce so decidedly to the establishment of such a valuable contribution to science, and to maintain, although it cannot elevate, the character of a man who, by his peculiar acumen and indefatigable industry, has in the very limited period allotted to his scientific labours, enriched so many of the paths of science by eradicating the weeds of empiricism, and in their stead sowing the seeds of principle, founded on the natural laws and affections of matter.

Paper XII., *on certain Forms of Locomotive Engines, by Edward Woods,* advocates the adoption of six wheels for locomotive engines, and points out the several disadvantages of the old locomotive, which have been overcome by the addition of a third pair of wheels.

The advantages obtained were almost immediately apparent. The engine lost in a great degree its peculiar rocking motion, as also the unsteadiness arising from lateral undulations; which latter effect was in like manner attributable to the diminution of the angle of which the oscillations were susceptible. Beside such direct and immediate results, time soon developed further consequences of an important nature. The component parts of the engine remained for a much longer period than before securely united and firm, the fastenings of the tubes became less liable to leak and give way, and the bolts and stays of the framings were less disturbed. Lastly, though not of least importance, an inherent source of safety was superadded, in the diminished liability of the engine to run off the rails in the event of the large wheels or the crank axle breaking. Instances in which this quality has been put to the proof have occasionally occurred. They have invariably demonstrated the high importance of the application as an especial security to passengers and to the attendants; and in consequence the principle introduced was not abandoned, even after the road had been entirely relaid with new rails.

Paper XIII. is an *Account and Description of Youghal Bridge, designed by Alexander Nimmo, by John E. Jones, A. Inst. C. E.* There is nothing particularly attractive in this bridge, excepting its great length. Its construction does not possess any new feature.

Paper XIV. is *on the Evaporation of Water from Steam Boilers, by Josiah Parker, M. Inst. C. E.* This is a valuable paper, containing a practical examination into that important subject, the comparative quantity of fuel consumed for the evaporation of a given quantity of water; and we regret that we cannot now enter more fully into this important paper, as it is one deserving of the attentive study of every person interested in the employment of a steam engine, whether he be a manufacturer of them or merely a proprietor.

Paper XV. is an *Account of a Machine for cleaning and deepening small Rivers, in Use on the Little Stour River, Kent, by W. B. Hays, Grad. Inst. C. E.* Much good may be effected by collecting drawings and descriptions similar to the one described in this paper, for we feel convinced that many of them would be found admirably well adapted for the formation of harbour and the improvement of tide rivers. We cannot explain the operation of the machine described by Mr. Hay, except from the drawings, which we could not copy without trespassing on the original work. We should feel obliged if some of our correspondents would favour us with drawings and descriptions of similar machines, and the cost of constructing and working them.

Paper XVI., *Description of the Perpendicular Lifts for passing Boats from one Level of Canal to another, as erected on the Grand Western Canal, by James Green, M. Inst. C. E.* This is another useful practical paper, clearly and accurately describing the construction and working of the lock, and accompanied by some excellent drawings, very beautifully engraved; but it is useless for us to attempt to give any lengthened extract, as the whole of the paper and drawings are necessary to a proper understanding of the construction, and as we have given an outline of this communication in Journal No. 8, page 200, and No. 9, page 229.

Paper XVII., *on the Methods of illuminating Lighthouses, with a Description of a reciprocating Light, by J. T. Smith, Capt. Madras Engineers, &c.* In this paper is described the system of lighting by fixed and revolving lights, and afterwards the mechanical arrangement of the reciprocating light.

The whole of the reflectors are fixed in their proper positions to a reflector frame, attached to a central spindle placed vertically, and to which motion is communicated from a machine of common construction (moved by a weight and regulated by fans) by means of a couple of bevelled wheels, one of

which is fixed on the vertical spindle just mentioned, and hence revolves in a horizontal plane; the other turns in a plane at right angles to the above on a vertical plane, its arbor or axis being at right angles to the spindle. Now, if instead of this single vertical wheel, acting continually on one side of the horizontal one abovementioned, another one be similarly situated on its *opposite* side, and engaged in the teeth on its margin, these two wheels are mounted on the same arbor and consequently turn in the same direction, it will be evident that they would, if successively engaged, produced *opposite* motions in the spindle and the apparatus, but that if both were engaged at the same time no motion at all could be effected, since by their opposite tendencies they would *act against* each other.

This successive action, therefore, is effected by fixing both of the wheels upon the arbor in the same manner as if they were singly employed, that is, with their teeth engaged at the proper pitch in the horizontal wheel above them, and then by cutting away those of the alternate semi circumferences of either, so that while those are engaged and produce motion in one direction, the blank circumference of the other is presented, and the moment the former ceases to act, the teeth of the latter come into play, producing an opposite movement.

Paper XVIII. contains *Experiments on the Flow of Water through small Pipes, by W. A. Provis, M. Inst. C. E.*, an abstract of which will be found in Journal No. 14, page 383. We regret that Mr. Provis had not time to carry out his experiments to different sized pipes, both straight and curvilinear, and also to an examination into the best form of connecting pipes with reservoirs and cisterns; likewise connecting one pipe with another. We hope that he will be able to resume his experiments, and give their result in the ensuing session.

Paper XIX. *Experiments on the Power of Men, by Joshua Field, V. P. Inst. C. E., F.R.S.*

In this paper are recorded the results of some experiments made to ascertain the working power of men with winches, as applied to cranes. The experiments were undertaken with a view of ascertaining the effect men can produce working at machines or cranes for short periods, as compared with the effect which they produce working continuously.

The apparatus, a crane of rough construction in ordinary use, and not prepared in any manner for the experiments, consisted of two wheels of 92 and 41 cogs, and two pinions of 11 and 10 cogs; the diameter of the barrel, measuring to the centre of the chain, was 11¾ inches, and the diameter of the handle 36 inches. The ratio of the weight to the power on this combination is 105 to 1.

The weight was raised in all cases through 16½ feet, and so proportioned in the different experiments as to give a resistance against the hands of the men of 10, 15, 20, 25, 30, and 35lbs. *plus* the friction of the apparatus. * *

In order to compare these experiments with each other, these results must be reduced to a common standard of comparison, and it is very convenient to express the results of such experiments by the pounds raised one foot high in one minute, this being the method of estimating horses' power. The number is in each case obtained in the following manner. I will take the first experiment.

Here 1,050 lbs. was raised 16½ feet high in 90 seconds; this is equivalent to $(1{,}050 \times 16{\cdot}5) = 17{,}325$lbs. raised one foot high in 90 seconds, which is equivalent to $(17{,}325 \div 1{\cdot}5) = 11{,}550$lbs. raised one foot high in one minute. In this case then the man's power $= 11{,}550$.

The same calculations being pursued in the other cases, give the numbers constituting the last column of the following table:—

No. of Experiment.	Statical resistance at handle.	Weight raised.	Time in seconds.	Time in minutes.	Remarks.	Man's power.
I.	10	1050	90	1·5	Easily by a stout Englishman	11550
II.	15	1575	135	2·25	Tolerably easily by the same man	11505
III.	20	2100	120	2	Not easily by a sturdy Irishman	17325
IV.	25	2625	150	2·5	With difficulty by a stout Englishman	17329
V.	30	3150	150	2·5	With difficulty by a London man............	20790
VI.	35	3675	132	2·2	With the utmost difficulty by a tall Irishman	27562
VII.	..	....	150	2·5	With the utmost difficulty by a London man, same as Experiment V.	21255
VIII.	..	....	170	2·83	With extreme labour by a tall Irishman	21427
IX.	..	....	180	3	With very great exertion by a sturdy Irishman, same as Experiment III. ..	20212
X.	..	....	213	4·05	With the utmost exertions by a Welshman ..	15134
XI.	..	....	35	....	Given up at this time by an Irishman	.....

We may consider experiment IV. as giving a near approximation to the maximum power of a man for two minutes and a half; for in all the succeeding experiments the man was so exhausted as to be unable to let down the weight. The greatest effect produced was that in experiment VI. This, when the friction of the machine is taken into the account, is fully equal to a horse's power, or 33,000lbs. raised one foot high in one minute. Thus, it appears, that a very powerful man, exerting himself to the utmost for two minutes, comes up to the constant power of a horse, that is, the power which a horse can exert for eight hours per day.

Paper XX., *Particulars of the Construction of the Floating Bridge lately established across the Hamoaze, between Torpoint in the County of Cornwall, and Devonport in Devonshire, by James M. Rendell, M. Inst. C. E., &c., &c.* Although last, this communication is one of the most important. It describes an entirely new method of forming a communication from one side of a river to another. We have no doubt the publication of this paper will lead to a very extensive introduction of the floating bridge in all parts of the kingdom. Mr. Rendell has accompanied his paper with some beautiful drawings, explaining the construction of all parts of the vessel, the engine, &c. In Journal No. 7, page 169, will be found an abstract of this paper, to which we add the following particulars:—

The cost of the first bridge, with its machinery and chains, was 3,222*l.* that of the second was 3,316*l.* The cost of the landing planes, shafts, and balance weights, 1,530; of engineering and law expenses about 1,000*l.*; making the whole expenditure about 9,068*l.* The yearly charges of disbursements amount to 691*l.* 7s. 6d. * *

As yet we have no means of fixing with any precision the sum which should be reserved yearly as a rebuilding fund, for the bridges and machinery are still as good as new; and the chains, which at first I expected from the great depth of the river would be an expensive item in the repairs, are scarcely at all worn.

The income of the ferry for the year ending 11th April, 1834, when the bridge was opened to the public, was 930*l.*, whilst for the year now just ending, the tolls are let at 2,000*l.* over and above the cost of collecting, being an increase in four years of 1,070*l.*, that is, the tolls have already more than doubled. This is the strongest evidence than can be adduced in proof of the great accommodation which the bridge affords. * *

In conclusion, I have only further to state, that whilst the bridge here described was in construction, one was established at Saltash (higher up the Tamar), and still more recently, a similar bridge (though differing in the arrangement of its details to suit the locality) has been established under my directions at Southampton, across the Itchen, which is, at the site of the bridge, 1,400 feet wide at high water, and is crossed eight times an hour. This bridge is found so formidable a rival to the *fixed* bridge a little higher up the same river at Northham, as to have drawn off nearly all the travelling, the trifling saving in distance into the Portsmouth, &c., road which the floating bridge and new road effect, being sufficient to induce all the stage-coaches and mails, amounting to eleven a day, and general travelling, to use it in preference. This is the most convincing proof that the accommodation is regular and commodious. Already the tolls of this bridge have been let for 2,500*l.* per annum, although the work has not been finished eighteen months; and the only traffic on the ferry previously to the establishment of the bridge was foot passengers, and produced only 400*l.* a year.

We have now gone through the whole of the papers, and although our remarks and extracts are rather extended, we feel our inability to do full justice to many of the important papers, but must beg our readers to be satisfied with the view we have been able to afford them of this work, which exhibits much sound practical information and naval research.

Illustrations of the Public Buildings of London, with Historical and Descriptive Accounts of each Edifice. By Pugin and Britton. Second Edition, greatly enlarged, by W. H. Leeds, in 2 vols. London: Weale, 1838.

We regret that the late period at which we received this work prevents us from entering into a critical examination of its details, but as the former edition has been, for many years, before the profession, the general basis of the work must be sufficiently known to them to render this delay a matter of less importance. On the present occasion we must content ourselves with reminding our readers that it is a work of high sterling merit, and to assure them that this new edition, which was so much called for, is not behind in maintaining this high character.

It contains outline engravings of most of the public buildings of the metropolis, with geometrical plans of each building, executed with great neatness and exactitude. Among the many important additions are Buckingham Palace, the Post Office, the Corn Exchange, and the Traveller's Club. The letter press of the former edition has been revised, and augmented with many valuable critical notes, which confer great credit on the gentleman to whom the editorial department has been confided. In the preface, Mr. Leeds points out the important share which he has taken in the improvement of the work, and as this will best enable the reader to appreciate his task, and the value of the new edition, we consider that the following extract from the preface will prove acceptable:—

To many it has been matter not only of regret, but of surprise, that a work like the present, so convenient and economical in form, and interesting to others as well as professional men, should not have been continued beyond the two volumes originally published; more particularly as in the interim from their appearance, a variety of structures of more or less merit and note have been added to the public edifices of the metropolis. That there is an abundant supply of fresh subjects for such purpose, will hardly be disputed;

many of them, as it is hoped this new edition will satisfactorily testify, even more interesting than several of those previously represented. Yet although there are ample materials for a third or even a forth volume, the present publisher deems it more advisable, as the work is now out of print, to commence with an entirely new edition containing several hitherto unedited buildings.

Besides the additions both in regard to plates and their descriptions, others to a very considerable extent have been made by the present editor, both in the form of notes, and of remarks appended to the accompanying letter-press by other writers. The opinions of the latter have been left untouched by him, even when decidedly at variance with his own; in order that the reader may adopt whichever shall appear to him the most judicious, and the best-founded. All that has been done in the way of altering the original letter-press, has been confined to abridging several of the articles, by paring away what was evidently extraneous matter, what related only very remotely indeed to the buildings themselves, and was by no means in accordance with the character of a work that is most undisguisedly of a strictly architectural nature, therefore not at all likely to find purchasers among those who seek merely historical and topographical information.

One unquestionable improvement upon the first edition is, that instead of the subjects being mixed together, without any attempt at arrangement, they are now classified under the respective heads of, I. Churches; II. Theatres; III. Commercial and Civic Buildings; IV. Buildings connected with Literature and Art, &c.; V. Palaces and Private Mansions: VI. Bridges. * *

In addition to the general classification now adopted, chronological order has been in some degree observed, and the works of the same architect, when belonging to the same class (as Wren's churches), have been placed together. The third, fourth, and fifth divisions, are so miscellaneous as hardly to admit of precise arrangement, on which account the only order attempted in regard to the first-mentioned, is that of their situation in the course from east to west.

As every one of the buildings now added to the original subjects is of quite recent date, no history as yet attaches to them; a circumstance the editor is far from regretting, because the respective accounts are now necessarily confined to remarks on the buildings themselves; whereas, when History and Architecture sit down to make a meal together, the latter gets very little more than the crumbs which fall from the table, while poor Criticism is fairly kicked under it, as if unworthy even to show her face. In the preface to his *Geschichte der Kunst*, Winckelmann gives us an anecdote to the purpose, of a writer who filled what professed to be an account of two statues of captive barbarian kings, with a history of Numidia! * *

And architects ought by this time to have discovered, that the better informed the public in general are in respect to their art, so much the better both for that and for themselves. In proportion as architectural topics can be made to engage general attention, and rendered matter of conversation and discussion in society, so will the public take a livelier and more extended concern in the art. In this respect something has been done of late years by the establishment of the "Architectural Magazine," which there is every reason to suppose has been the means of leading many to direct their attention to a study which, if rationally pursued, is not without its allurements for others besides professional men.

More recently another periodical has appeared, entitled "The Civil Engineer and Architect's Journal," which, in conformity with its title, devotes itself more particularly to strictly technical and practical matters, yet by no means to the exclusion of more popular subjects. Both these publications have already effected some good in disseminating a taste for such studies, and in diffusing more enlarged and liberal views in respect to the æsthetic principles of architecture, than have hitherto prevailed.

How far the editor's own criticisms, here offered to the public, satisfactorily exemplify what he recommends, must be left to the reader to determine. At all events, they are in no very great danger of being found fault with on the score of not entering sufficiently into details, or of being too dry and formal. Leaving alone what may be thought of many of the opinions and remarks they contain, they will strike different persons very differently, because some will relish them all the better for that, on account of which others will probably object to them. The writer who attempts to accommodate himself to the particular taste of every one, will please no one; whereas he who satisfies himself, will at all events have the luck of pleasing some one, and be apt to write naturally, if not originally. * *

Should what has been done be found to give satisfaction, the editor will most probably resume his task, it being in contemplation to carry on the work by at least one additional volume; yet further than that probability is at present in favour of this being done, no assurance is here given—no positive promise made, because the performance of it will in a considerable degree depend upon the reception that shall be given to the two now published. * *

Even when all the available materials shall have been exhausted as regards the metropolis itself, there would still remain a new and ample stock for a similar—or companion work to the present one, illustrative of the Provincial Architecture of England.

As the field would be so extensive, such a work ought to be confined to the very best specimens, and to such as are unedited. The idea of a work of the above description, however, itself belongs to that species of architecture denominated "castle building," it being as yet matter of doubt whether the plan here hinted at will be acted upon. *

To speak, by way of conclusion, respecting his own share in the present volumes, it will be evident enough that the editor has not scrupled to impugn many *veteris mendacia famæ*, and to indulge in some observations that can hardly fail to shock what the author quoted on the title page calls the "orthodoxy of pedantry." Yet if not uniformly in accordance with those commonly received,—if they occasionally tread too sharply on the heels of prejudices,—if, moreover, some of them shall be convicted of being erroneous, as well as unpalatable, the opinions here put forth by him may at least claim the merit of being independent and unborrowed. He may also be allowed to say, that in the articles now added by himself, he has endeavoured, as far as the subjects themselves afforded scope for doing so, to invest description and criticism of this kind with some degree of interest, by impartially pointing out both merits and defects, and by calling attention to particulars, which, more frequently than not, are passed over altogether. If, therefore, in some instances praise and censure nearly balance each other, that circumstance argues no inconsistency in him, whatever it may do in respect to the buildings so spoken of.

The further examination of the work we must delay until next month, and in the meantime we earnestly recommend this work as a valuable addition to the libraries of the elder members of the profession, and an excellent guide for the studies of the younger.

Versailles: Heath's Picturesque Annual for 1839. Twenty highly-finished Engravings. Longman and Co.

If we have been greatly disappointed by the new volume of the "Landscape Annual," which exhibits a falling-off as sad as it is sudden from its predecessors for the last two or three years, both as to the subjects and the execution of its engravings, we are not a little agreeably surprised at the improvement manifested in this one of the "Picturesque." One very great and obvious improvement is the adoption of Hancock's patent binding, which will prove a most valuable invention indeed, if it can be applied to large architectural works and books of plates, since it causes the book to lie quite flat when open, whereas very great inconvenience is generally felt in the kind of works alluded to, inasmuch as they are quite curved towards the middle, so as frequently to render it almost impossible to take horizontal measurements with accuracy, on that side of an architectural engraving which is next the back of the book.

The "Picturesque" gives us this year several architectural subjects, and those too of a class which are of comparative rare occurrence, we mean interiors of galleries, and other splendid apartments. That such subjects should so very seldom be made choice of, is hardly owing to their want of interest—for we hardly know of any that are more so—but may very fairly be attributed to two circumstances; first, the difficulty of obtaining access to them, for the purpose of taking views; and secondly, the greater care and time required for the drawings, and afterwards the engravings. Here effect alone will not answer the purpose; in an exterior view, it seldom happens that there is occasion to show much of the minutiæ of details, because it seldom happens that any part of the building represented comes immediately into the foreground; but in interiors, all the details of foreground, whether those of walls, ceiling, pavement, or carpet, together with those of furniture, must be distinctly shown and expressed, let them be ever so intricate, complicate, and elaborate. Of what may be effected in such subjects, even within the compass of an octavo plate, we have here proof in those of the Chapel, the Grand Gallery, the Gallery of Statues, the Theatre, &c., in a palace remarkable for its lavish decorations though not exactly a model as regards the taste displayed in it. Most of these plates are from drawings by Mackenzie, whose admirable talents for similar subjects stands in need of no compliment from us; nor can we but wonder at the extraordinary diligence with which every piece of detail is elaborated. As an instance, we refer to the cornice and ceiling of the Gallery of Battles, also to the Great Gallery or that of Mirrors, so called from the arcades opposite to, and corresponding with the windows, being filled with plates of glass to resemble other windows.

We do not recollect having before met with any interiors of this class, so highly finished-up; for they have either been in imitation of coloured drawings, as those in Pyne's "Royal Residences," and Nash's "Brighton Pavilion," or else very different as to subject; for instance, the elaborately engraved interiors of Henry the Seventh's Chapel, in "Neale's Westminster Abbey," a work, by-the-by, that places that artist in the very highest rank of architectural draftsmen. With these specimens in the "Picturesque" before us, we cannot help being of opinion that there is a very extensive and almost untouched field of architectural illustration open to any one disposed to enter upon it. Numerous subjects, of equal or even greater pictorial interest, might be found without quitting our own metropolis; and a work illustrating them after the style of the engravings in this Annual, could hardly fail of success. Nor perhaps could any one be found fitter for such an undertaking than Mr. Heath. We hope he will take our well-intentioned hint, and thereby fill up the utter blank that at present exists in regard to one department, and certainly not the least unworthy one, of the graphic illustration of our architecture. Meanwhile we congratulate him on the improvement manifested in his "Picturesque Annual" this year, which we recommend to all our architectural friends;—not, however, for the letter-press portion, which might have been better, if instead of translating what

was furnished for the purpose by a Frenchman, Mr. Leitch Ritchie had availed himself directly of Zinkeisen's Historische Rückblicke on the Palace of Versailles, which is a most interesting historical and architectural memoir. Very probably, however, the letter-press will generally be considered of very secondary importance—at least such seems to be the case with most publications of this class; and if so, the engravings in the "Picturesque" this year give it a decided superiority over its rivals, and that not only on account of their intrinsic interest, but also the novelty of their subjects; whereas the picturesque of landscape scenery has of late been served up so often, as to be now quite hackneyed and stale.

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1. *Geology of England and Wales, with a Map.* London: Grattan. 1838.
2. *Geological Map of England, Ireland, and Scotland.* By Professor Phillips. London: Weale. 1838.
3. *Geological Map of the British Isle.* London: Wyld. 1838.

These are some of the recent fruits of the progress of Geology in the public mind. The first is an elementary compilation with a small map, which presents two novel features; first, that the strata are represented by various modes of lineshading on the plate; and secondly, that it was originally published for threepence. The second is the first map of the whole of the British Isles, but being on a small scale admits but of little novelty in detail. The remaining work is an endeavour to render this class of maps cheap and easily accessible to the public.

Report to the "Académie Royale des Beaux-Arts de l'Institut," made in the Session of 1838, on the Work published at Milan in 1829, by M. Carlo Amati, *entitled "Dell' Architettura di Marco Vitruvio Pollione, libri dieci publicati di Carli Amati, Professore Architetto, membro di varie Academie, e della Commissione d'Ornato publico di Milano."* By M. Guenepin, Honorary and Corresponding Member of the Royal Institute of British Architects. [Translated from the French MSS.]

[As the subjoined paper excited considerable interest in France, we have availed ourselves of this opportunity to present a translation of it.]

The author of the work is M. Carlo Amati, architect, of Milan, for the last thirty-five years Professor to the Imperial Academy; Member of the Academy of Vicenza, and of many others; decorated with the order of St. Stanislaus of Russia; and lastly, Member of the Commission for the Public Embellishment of Milan.

M. Amati, who is architect of the cathedral of that town, has erected, according to his designs, a great number of buildings, both public and private; twenty-seven churches have been either built or repaired by him; and he is at this moment raising a Christian temple under the invocation of St. Charles Boromeo on the Corso de Servi at Milan, in place of the present church: the plans of which temple he has published in a volume, to be found in the library of the Institute; and on which one of our fellow-members will undertake the task of addressing you.

Notwithstanding such manifold and weighty occupations, and the unremitting attention that M. Amati has for many years paid to a number of scholars succeeding each other in his office, he has yet found leisure enough to publish several works relating to architecture, among which is a folio edition of the "Five Orders of Architecture," by Vignole, to which he has added some of the plans executed by that architect, a Treatise upon Shades, a work on the ancient Thermæ of St. Lawrence, at Milan, and, lastly an Italian edition of Vitruvius, in two volumes, illustrated by numerous well-engraved plates.

It is this work which is the object of the present review. M. Amati, full of love for his art, and of zeal for the instruction of his pupils, beheld them with regret deprived of the valuable assistance which they might have derived from the study of Vitruvius. In fact, there are but few editions in Italian of that author, for the most part very old, and only to be obtained with great difficulty. The important works published of late years on Vitruvius are little known in Italy; those of Rode, Schneider, Stratico, and Poleni are written in Latin, and can consequently only be understood by a few. M. Amati being desirous to remedy a want so prejudicial to the study of architecture, urged on by an irresistible desire of being useful to his profession, and encouraged, moreover, by the profound research he has bestowed upon the ancient monuments of Italy, did not hesitate to undertake an Italian translation of Vitruvius; an unthankful and laborious task, to which his modesty has allowed him to prefix the title of publication only. The terms which he has himself used in the preliminary notice of his work are remarkable for their simplicity and propriety; they deserve to be recorded word for word, and will explain, better than I can do, the utility of this undertaking and the able character of its author.

Having set forth some general considerations on architecture, M. Amati thus expresses himself:—"What Quintilian, speaking of eloquence, said of Cicero, may be applied to Vitruvius and architecture; that he who takes pleasure in the writings of Vitruvius will acknowledge himself to have profited not a little by the study thereof.

"Owing to the scarcity of the editions of Vitruvius, it has appeared to me to be necessary to publish a new one, convenient, cheap, and adapted to the capacity of that part of our youth who have devoted themselves to such an important profession.

"For many years I have directed all my cares and studies to this object, the utility of which is so considerable. Among the numerous editions that I have consulted, those of Durantino, Giocondo, Barbaro, and Schneider,—of Galiani, Orsini, and that of Stratico, and Poleni,—have chiefly served for the basis of this: I have merely added some short notes, rested upon the ancient monuments, or drawn from the commentators, in order to throw additional light upon the subject. The drawings follow the progressive order of the author's writings. I have annexed several from the most interesting works of Roman antiquity, for the most part examined on the spot, and measured by myself, and some others taken from the monumental remains of Greece, for the purpose of explaining and clearing up the true sense of Vitruvius' text. Each plate is accompanied with a succinct explanation of the principal proportions as they are to be found in the text itself. These plates are for the most part compiled from the original reading, and I have taken some from the illustrations of the most eminent commentators. Thus this edition will abound in nothing of mine, so much as the goodwill of being useful to those students of architecture, the instruction of whom has been for the last thirty years one of the most pleasing employments of my life."

It is not without some motive that I have rendered literally the words of our author; for they not only give a very complete idea of the end which he has proposed to himself, and of the path he has pursued, but they at the same time explain the wide difference that separates his publication on Vitruvius from the important editions of that author's works by Schneider, Stratico, and Poleni, and more recently, that of the Marquis Marini.

We must not expect, therefore, to find in M. Amati's edition all the enlargements, explanations, comments, dissertations, discussions, and other illustrations, with which the authors just named have, after the fashion of their predecessors, enriched their productions. In the simple *Notarelle* announced by M. Amati, as intended to render more intelligible the text, we have none of that ponderous baggage more voluminous even than the work; nor shall we meet there with any of those happy and unforeseen discoveries, or those luminous interpretations that present in a new light some of the many passages of Vitruvius which are yet but imperfectly explained, or which have been disfigured by commentators often more obscure than the author himself.

I could nevertheless quote a number of passages where M. Amati has in few words solved many serious difficulties which had often brought the reader to a stand; but the explanation alone of these difficulties, the discussions they would bring with them, and their enlargements, would far surpass the time placed at my disposal.

M. Amati has certainly done signal service to the art he professes with so much distinction, by giving to his countrymen in their own language an edition of Vitruvius, containing the result, and, in some sort, the summary of the labours and inquiries which have occupied so many architects and learned men since the revival of letters. By means of this work, the fruit of many years' experience, the student will avoid those investigations, always dry and tedious, and often inaccessible to the novice in architecture. The help of his profound erudition and long practice has alone enabled him to present to them in abridgement, if I may so express myself, the instruction which those who deliver themselves up to the pursuit of this science could not have obtained otherwise than by an assiduous and lengthened labour. We understand what care and perseverance it must have cost to have annihilated even the traces of the trouble an undertaking of this description must have involved.

If, then, M. Amati's work is not of those which open a new road to the interpretation of Vitruvius' text, or remove the boundaries of art, still it will possess the no mean advantage of increasing the circle of those who cultivate it, and of extending the taste for architecture, by rendering more attainable the means of its study. At this time, when the applications of art become daily more frequent, there is a happy *apropos* in placing within the reach of a greater number the acquisition of that information it imperatively requires.

Everything, then, that is important to be known in those editions which have been published down to the present day, will be found in this of M. Amati; with the sole exception of the magnificent Latin edition, in four folio volumes, published at Rome, in 1836, by the Marquis Manni, from a press established on purpose by the author;

an immense and splendid work, to which he has dedicated many years of his life, and which he has enriched with one hundred and forty engravings, and all the documents that he considered necessary to make it complete.

M. Amati has signified his intention of publishing, for the use of those who may wish to read the works of Vitruvius in the original, the Latin text of that author, in a single volume, with the various readings, faithfully selected from the learned edition of Udini.

In spite of all that has been said and written of Vitruvius, it is impossible to speak of his works without noticing the author; and we cannot abstain from remarking, that something extraordinary seems to attach itself both to his person and to his productions. Vitruvius himself is but imperfectly known; it has not yet been decided whether he was really an architect, or simply an amateur, as may be inferred from several passages in his book. There is nothing certain as to the time in which he lived; his name and his country have been the objects of endless discussions, which have arrived at no definitive result; and now it is asserted that he never existed.

In Germany, where the wildest paradoxes are sometimes maintained with an earnestness that proves conviction, and sometimes with a boldness that carries weight, it has been asserted that Vitruvius was but an imaginary being.

In the work entitled "Rhenish Philological Museum" (Rheinisches Musæum fur Philologie), there is to be seen a correspondence which took place between Goëthe and Dr. Schultz, in 1829. No one will be astonished to see Goëthe, a poet, and almost universally skilled in literature, engaged in an architectural discussion, whilst, at another Academy of the Institute, are proclaimed his discoveries in botany and comparative anatomy. (Session of the Academy of Sciences of the 12th March, 1838.)

Dr. Schultz, a very learned man withal, and whose reputation in this respect is incontestable, affirms that the work of Vitruvius is a compilation of the tenth century, made by Sylvester the Second, who had been Archbishop of Rheims before he was made pope, and when, under the name of Gerbert, he was as yet but Abbot of Robbio. The basis of this work might have been borrowed partly from evidences collected from the Greeks and Romans, and partly from Arabic fragments; but the primary origin of the compilation would be due to a similar work in Greek of the fifth century. Dr. Schultz moreover intimates, that it might have been dedicated at that epoch to Otho the Second, or perhaps later, to Otho the Third.

Goëthe appears to have entertained with him this opinion, if we refer to what he says on this subject in his complete works (vol. xxiv., p. 142, and vol. xxvii., p. 191). With these many learned men of Bonn, Francfort, and elsewhere also agree—Messrs. Osarin, of Giesen, Welcker, Professor at Bonn, and Weber, of Francfort.

Dr. Schultz, above all, rests upon the little concord existing between Frontinus and Pliny, on the one hand, and Vitruvius on the other, concerning aqueducts, and the inclinations on which it is proper to construct them. In the Roman works of the Augustan age, according to Vitruvius, in the sixth chapter of the eighth book, it was usual to give the subterranean ducts an inclination of one or two inches in 100 feet; but above ground, and more especially in aquaducts, the inclination was still less. A fall too rapid would have had the inconvenience of leaving the pipes dry, and of supplying troubled and muddy water.*

The maximum inclination pointed out by Vitruvius does not equal the minimum employed by the Romans even in their mock-naval fights, where the pipes were subterranean, and consequently more exposed to resistance, and in which it was less important to obtain the water limpid and clear, than to fill immense spaces in a short time.

Several other discrepancies between the doctrines of Vitruvius, and what is related by Pliny, Frontinus Mechanicus, Atheneus, the compiler of Alexandria, and other authors, have served Dr. Schultz for a basis on which to found his assertions. I refer to his correspondence with Goëthe, to explain the texts upon which he relies. I could not here dwell upon them without swelling beyond measure a report already too long; perhaps, indeed, I have insisted too much on an opinion so whimsical as to appear to belong rather to the history of the human mind than to that of architecture.

The work of Vitruvius has not been more free from the vicissitudes of opinion than his person—for books as well as men have their fate. At the revival of literature it was welcomed with the blindest enthusiasm, its precepts were recognised as infallible, and its author was for a long time regarded as the supreme law-giver in architecture; but when a vigorous investigation of the text had exposed a number of unintelligible passages, the obscurity of which, no doubt, arose from the absence of explanatory plates not to be found with the manuscripts, and still more when the assiduous researches on the monumental antiquities every where coming to light, had shown that, in many instances, the doctrine of Vitruvius did not tally with those beautiful models bequeathed to us by the ancients; the implicit faith our author had inspired was replaced by a more considerate and qualified admiration. And it was understood how a profound and attentive study of this work, united with that of the monumental remains, might illumine, and perhaps establish the theory of architecture.

These studies, continued with perseverance up to the present time, far from being barren, have borne abundant fruits; a great number of obscure passages have been explained, and everything inclines us to the belief that notwithstanding the success that has hitherto crowned the labours of art and erudition, of which Vitruvius is the object, much may yet be done. The study of the Grecian monuments, disentangled and simplified, may lead us to hope that the lost drawings of Vitruvius's work may be recovered from the ruins of the monuments he has cited. Already some valuable remains of edifices mentioned by him have been recognised, and though the much desired time for rightly interpreting the text of Vitruvius does not appear to me to be yet arrived, it cannot be far distant.

It is not at all certain whether Vitruvius had ever travelled out of Italy, though the monuments of Asia Minor are those he cites most willingly; he does not seem to have attached much importance to, or perhaps he was but imperfectly acquainted with, those of Attica and Greece. He even goes so far as to advance, in the third chapter of his second book, a remarkable opinion that I shall quote from the translation of Perrault:—"There have been certain ancient architects who did not conceive the Doric order to be fit for temples, as there was something inconvenient and embarrassing in its proportions. Farchesius and Pytheus were of this opinion, and it is also said that Hermogenes having a great quantity of marble for constructing a Doric temple to Bacchus, changed his plan, and made it Ionic. (Nonnulli antiqui architecti negaverunt Dorico genere ædes sacras oportere fieri, &c.)

It is probable that these Doric temples of Greece, of Sicily, and even those of great Greece, although situated in Italy, were almost entirely unknown to him.

It is also probable that to the study of the ancient monuments of Attica, and the other parts of Greece, at this moment followed up with so much activity, will succeed that of the antiquities of Asia Minor; then the comparison which may be made between the edifices cited by Vitruvius, and his own work will, perhaps, explain the difficult passages of the text, in the same way that those parts of the monuments which may need interpretation will be explained by him.

This work will thus become more valuable; it ought then always to be considered, and deservedly so, as one of the most precious that antiquity has transmitted to us. In it will be found a new source of information, curious remarks which could not be met with elsewhere, and details full of interest on the state of the arts and sciences among the ancients. The greatest benefit will fall to the share of the student, and it will be allowable for every one who has read it to boast that he has done so, and above all that he has understood it.

* According to the same Dr. Schultz, Pomponius Mela is likewise a supposititious writer; the work entitled "De Situ Orbis," is a youthful production of Boccacio, the author of "Decameron," who might have availed himself of the fragment bearing the same title of the ninth or tenth century, and deposited at Mount Cassino.

ORIGINAL PAPERS, COMMUNICATIONS, &c.

RALPH REDIVIVUS—No. 11.

THE CITY CLUBHOUSE.

This is certainly the handsomest clubhouse in the City, for the simple reason that it is at present the only one, therefore has nothing to apprehend from comparison with any rival in the same quarter. Similar, however, as it is in its style and general design to one or two at the other end of the town, it is as far remote from them in taste as is east from west,—which, perhaps, the reader will say, is no more than right and proper, considering the respective localities. Yet how, it will—with another *perhaps*—be asked, if it is cognate with them in style, can it be so foreign from them in taste? For the very simple reason that the style itself is treated without taste.

Of late years there has been a vast deal of prosing and twaddling about styles of architecture, to very little actual purpose; for after all that is said, it is of infinitely more moment how the style is treated than what it is; because the very best style may be rendered feeble

and trashy, tasteless and insipid, by bad management of it, and an inferior one imbued with elegance and spirit by a mind capable of entering into it with *geniality*—that is, a mind capable of infusing fresh vitality into its elements. Now, although mixed with a great deal of rubbish and dross, the elements of Italian architecture are so complex and varied, that if well filtered from their impurities, and a little of spir. gen.—which must not be mistaken gin—be added to them, they are almost all-sufficient for any occasion. The misfortune is, that the same spir. gen. is not a marketable commodity—is not to be had for money, nor to be procured at any dispensary whatever; accordingly, it is mostly dispensed with altogether, and those who have it not, get on as well as they can without it, or contrive, perhaps, to make the world believe that they possess of it at least *quantum sat.* All this, however, is merely proem—the printer, I hope, will blunder it into poem. But *revenons* in good earnest: the building in question is stamped, I will not say by all the defects of the style, neither by its worst vices, but by its most tolerable faults, without any of its redeeming qualities. There is nothing particularly to offend, so also is there nothing whatever to admire. Its worth as a design is altogether negative, for it has that *je ne sois quoi* of badness which it is as impossible to define as it is the correspondent quality in regard to beauty. Without being particularly ugly, it is more than particularly inelegant. Without presenting any very glaring solecism it is mawkishly mediocre, and exquisitely dull *secundum artem.* There is little in this façade which, taken by itself, can be censured as decidedly bad—at least not as at all worse than may be observed in many other buildings that possess some degree of merit; but everything about it is poor, has an awkward, plodding air, and bespeaks utter apathy of taste. There is, if may I be allowed the expression, the mere *surface* of the style, just enough of it by which to recognise it, without anything to give assurance that the architect himself has any relish whatever for it, or knows it otherwise than as a schoolboy has got his lessons. The remark just made applies unfortunately not to this building, but to many others—to a very large proportion indeed of our modern *soi-disant* Grecian and Gothic, which too evidently betray that those who designed them have but very little kindred feeling for, and but very imperfectly understand, the resources of the respective styles. To which remark I may further tack, by way of *codicil*, that architects are too apt to complain, and lay the fault upon circumstances; when the deficiency rests mainly, if not entirely, with themselves. Undoubtedly it much more frequently than not happens, that an architect is fettered and cramped, not merely by considerations of economy, but also by whims and caprices of others, and prevented from following out his ideas; yet let him be ever so much cramped that way, he is not, therefore, hindered from accommodating his ideas to circumstances; and thus debarred from proceeding, as he probably might do, according to some approved precedent, he is still left to the resources of his own mind, provided he has any, together with those of his art;—in one word, to show his feeling and his originality. Merely to do well what a hundred others could perhaps in the same situation do *quite as well*, is no very particular achievement; but to possess such a mastery over the elements of beauty as to hold them at beck, and compel them to diffuse a secret grace over the most unpromising subject—to do that—to ennoble what in other hands would sink into utter insignificance, if not into positive hideousness, is far worthier than it would be to erect a second Parthenon. However confined and cramped he may be, a man of genius will never betray it, because he will take care not to let it be seen that he has aimed at one tittle more than he has been able to accomplish.

Encore, revenons. I was saying that the architect of the City Clubhouse seems to have very little real feeling for the style he has adopted; because, instead of availing himself of one of its best characteristics, he has substituted for it what, while it reminds us of it, makes us feel its great inferiority. I allude to the insipid horizontal stripes on the piers between the windows of the lower floor, thereby giving his basement an air of finical neatness and spruceness quite at variance with the formal taste elsewhere displayed, and more especially with the grotesquely cumbrous richness of the trusses and festoons to the doorway. Here, then, we behold in juxtaposition two most incongruous specimens of architectural costume, and though there may be some novelty in putting them thus fancifully together, there is assuredly very little originality, or rather quite the reverse of it. Had this doorway been rendered obviously the principal feature in the composition, and the rest treated as altogether secondary, then it might have been even still more ornamented, without appearing at all too much so. Even had the *outré* fashion of decoration here set been consistently followed, and expanded throughout, there would, at all events, have been unity, and the partial heaviness now so observable would have been avoided. Where uniformly adhered to, even heaviness may be a merit rather than not; for it is conflicting expressions, which must by no means be confounded with *contrasts*, that are injurious in architecture.

If, too, this doorway, so overcharged with fantastic ornament—that is, with ornaments which appear quite fantastic in comparison with the design generally—does not at all agree with the other parts of the basement, it is not much better in accordance with the exceedingly stiff and dry details of the upper part, where the Doric pilasters just serve to produce a certain cold formality and littleness, and where the dressings to the windows have a miserably meagre look. Infinitely better would it have been had the architect omitted pilasters, and decorated the whole front with bossages or rustics of different kinds, those below being more boldly expressed than those of the upper floor. That he did not adapt this is the more to be regretted, because we have no such example of the Italian style, notwithstanding that it affords so much scope for design, and is compatible with a very high decoration in the windows.

The fact is, even those who affect to admire and extol the Italian style appear hardly to understand what it is capable of, or to comprehend by it more than its most commonplace and uninteresting elements, without regard to those richer and more delicate qualities, of which the façades of the Travellers' Clubhouse afford two such beautiful examples, and upon the least of whose details more study probably was bestowed than was upon the whole design for the Clubhouse in Broad-street, unless it be that instinctive taste supplied the place of studious consideration. I am inclined to imagine that far less depends upon the style chosen, and far more upon the treatment of it, than persons in general seem to suspect; for while the very best may, as we daily see, sink down, not only to mediocrity, but to drivelling dullness and imbecility, so may the very poorest acquire a power and charm when taken up with geniality, and touched *con spirito, con gusto, con amore.*

DUTCH ARCHITECTURE.

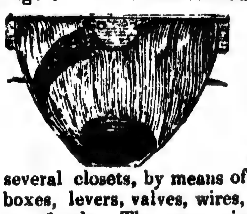
[The following extract from a letter written by a foreign architect, one of the corresponding members of the Institute of British Architects, to his friend, an English architect, conveys so just and striking an opinion of the architecture of Holland, that we doubt not it will be acceptable to our readers :—]

As you are acquainted with the town of Rotterdam, I have nothing new to tell you about it. I shall only add, that it perfectly brings to one's recollection the thousand views of Dutch towns to be met with in different picture-galleries; it does not, however, answer to the ideas of cleanliness which one forms respecting this singular country, and which, in the midst of a general movement, remains, to all outward appearance, in precisely the same state in which it was a hundred years ago. From Rotterdam, I went to the Hague: its general character differs but little from the Dutch towns; the country, however, is more agreeable, and the monotonous plain which pursues one in Holland, is partly hidden by a wood that surrounds a part of the town, and in which is situated a pavilion of the King, remarkable for nothing but its extreme simplicity; a large central hall, on account of its size, and the paintings it contains of the great masters, forms a distinct feature among the objects by which it is surrounded. I was much astonished at the Hague, by the extraordinary phenomenon of their executing *two new buildings at the same time;* it must have been a long, long time since a similar event occurred. One of the buildings, with a portico of columns, is intended for a sort of concert room; the other is a villa on the border of the wood; the general style of architecture of both evidences a good design, at the same time that it betrays a weakness in the carrying out, arising from want of study. You are aware that this town contains a rich and unique collection of interesting objects of all kinds, from China and Japan. I went over it with pleasure, and many objects connected with architecture and interior decorations interested me very much by their originality, and the good sense which they evidenced. This good sense—precious as it is—is becoming daily more rare amongst us: in saying *us*, I mean artists in general. From the Hague I made an excursion to Leyden, whilst I was waiting for the minister of Würthemburg (to whom I had an introduction) to prepare my letters for Amsterdam. I confess that I was infinitely better pleased with Leyden than with any thing I had before seen in Holland. I did not indeed find a better style of architecture, nor superior scenery; but the cleanliness and breadth of the streets, the well kept canals, and the quiet which reigns there, so consistent with the existence of an university, produced a very agreeable impression upon my mind. I visited the botanical gardens and hothouses, but found them nothing in comparison with what I had seen in England. To satisfy my conscience I

ran through the rooms containing the immense collection of natural history, and took a hasty glance at the skeletons and mummies, hoping to feast my eyes by the sight of the collection of birds and butterflies, for which I have quite a passion, on account of the elegance, the variety, and the brilliancy of form and colour, which nature has lavished upon these creatures; I was, however, disappointed, for these classes were not yet arranged, and the rooms were closed. I went to see the monkies, toads, bats, and other objects of this kind, which do not please the imagination of an artist, even whilst they are living; and which are repulsive when seen under glass, or in spirits of wine. As regards buildings I can only cite the Hotel de Ville, the exterior of which, though somewhat whimsical, has a certain piquant air, and bears the impress of Dutch architecture of the sixteenth century. After Leyden I proceeded to Amsterdam—with its pestilential canals, painted houses, and, for the most part, dirty streets, I searched in vain through this large city for a single building, which might please and satisfy an architect. The most common-place taste, mixed up with old-fashioned details, and an insignificant puerile and sterile invention pervade everything here. Even the Hotel de Ville, which is converted into a palace for the King, although of very vast dimensions is not grand, and only serves to prove, that even with immense sums of money a people without imagination and without refined sentiment must remain sterile and dry in their productions. I did not regret leaving Amsterdam for the pretty little town of Haarlem, which contains more than one edifice curious for its antiquity—there is one large church paved with wood, the walls very white and bare, copper lustres very bright, and an organ celebrated for the richness of its tone and the variety of its pipes. The environs of Haarlem present a long series of gardens and country houses of a bad style of architecture, such as I had observed throughout Holland.

ROE'S PATENT WATER CLOSET BASIN.

We noticed Mr. Roe's improvement on water closets when he exhibited one at the Architectural Society last session, and gave a drawing of the basin and a description, in Journal No. 6, page 141; since which Mr. Roe has considerably amended and simplified their mechanism, and has fitted up several under the directions of Mr. Hardwick at the Marylebone school, also for Mr. Wyatt and other architects. He is likewise about to supply a large number of them for the new hotels and dormitories now erecting at the Birmingham Railway Terminus, Euston-square. The principal improvement is in the basin, the edge of which is surrounded with a small chamber or recess, as shown in the annexed engraving.



This chamber is always kept charged with water, and when the handle is lifted, the water is discharged all round the basin, as well as the fan at the back, thoroughly and momentarily cleansing the pan. Another advantage of this addition to the basin is, that it saves the expense of a water or service box in the bottom of the cistern; and that the water may be laid on to several closets, by means of one pipe, instead of having distinct pipes, water boxes, levers, valves, wires, and cranks to each, which are continually getting out of order. The communication from the pipe to the basin is shut off by a stop cock, which is turned off and on by simply pulling up the handle of the closet in the ordinary way; and when the hand leaves go, it is immediately pulled down by the weight below, and shuts off the water, thereby preventing any waste. Although this arrangement is not new, we mention it, as Mr. Roe has obviated one great inconvenience in the cock, by making the key fit with great accuracy, and introducing an oil cup over the water way, which is always charged with oil, and constantly lubricating the key to prevent it setting fast or grinding, thereby avoiding leakage.

We are decidedly advocates for abandoning all the superfluities of the water-closet, and substituting, instead of the complicated apparatus of the valve, lever, water box, air and wire pipe, service box, wires and cranks, simply one pipe, with branches to each closet, as is effected by Mr. Roe. If the pipes be covered with a non-conducter of heat or cold, as hemp or wool, (as ought to be done with all pipes exposed to the weather,) there will be no fear of their bursting in frosty weather. If it should still be the wish to pursue the old plan of having a valve and the usual apparatus, the same may be used without having the water box. The Patentee, at No. 69, Strand, will be able to afford every illustration as to detail to any member of the profession.

MOMENTUM OF FALLING BODIES.

SIR,—It would be rendering an essential service to many of your readers if some of your professional correspondents would give some information as to the effective blow of the ram used in driving piles.

We all know that the effective blow of a body in motion is its momentum; and also that the momentum is measured by the weight multiplied into its velocity. A second being the shortest space of time which we can easily measure, the velocity acquired by a body in that time, falling from a state of rest, has been ascertained; and as the accelerated velocity is governed by known laws, the velocity, or rather the number of feet passed through, in a second of time, has become the datum of all calculations regarding the momentum of bodies. The rule therefore given to ascertain the momentum, is to multiply the weight of a body by its velocity *in feet per second.*

This rule is doubtless correct in a comparative estimate of the momenta of different bodies in motion; but I do not know that the rule would hold good in comparing a body in motion with one at rest. That is to say, that a body of the weight of 5lb., moving at a velocity of 16 feet per second, would produce the same effect as one of 80lb. at rest. There are, doubtless, a time and space which would be the exact measure of the effect produced in weight; but whether that is the velocity in feet per $\frac{1}{2}$, 1, or 2 seconds, nothing but a set of well-directed experiments can determine.

I have carefully examined several mathematical works in order to ascertain this point, but have been disappointed; and not being able to discover any reason why the number of feet, passed through in a second of time, should measure the effective momentum, any more than the number of yards, or inches, I should be obliged if some of your more enlightened correspondents would give us some information on this subject; or if the results of any experiments on the subject have been published, would direct us where they are to be found.

The subject, you will perceive, is one of considerable importance, as the stability of all bridges and buildings, erected upon piles as a foundation, depend upon it. The practical result to which I wish to arrive being to ascertain what weight, in a state of rest would produce the same effect as a ram of known weight falling on a pile at a certain velocity.

Hoping the subject may be deemed worthy the attention of some scientific correspondent, I remain, yours, &c.

November 13th, 1838. C. E. C.

THE NELSON MONUMENT.

The chief symptom of this project's exciting any interest among architects is that a plan of the site has been published for their assistance. Nevertheless it is a matter that ought to be timely attended to; and instead of holding back their remarks, as generally happens until the time for profiting by them has quite passed away, those who are, or fancy themselves capable of offering sound advice, should not delay it until it becomes little better than annoying, mischief-making impertinence. We have had quite enough of that mode of giving counsel in the affair of the new houses of Parliament, when, for some time after every thing had been settled, certain busy-bodies put forth pamphlets protesting against the style of architecture adopted and the site of the edifice; therefore, if intended to be of any use, the objections ought to have been made beforehand, and while there was opportunity for adopting them, without undoing and unsettling everything, and beginning, in fact, entirely *de novo*. Their excuse must be that they were conscious it would make very little difference at what time their advice was offered; and they could, besides, at any rate fancy that it would have been acted upon had it been forthcoming earlier.

In regard to the competition for the Nelson Monument, there is one thing that looks like extreme liberality, namely, that no restrictions nor conditions of any kind are imposed, further than that the cost shall not exceed 30,000*l*. The competitors are allowed, in fact, to choose their own subject—column, arch, or whatever other form they may devise for the purpose. Yet if thus far quite unfettered, I cannot help being of opinion that they must also be proportionably perplexed; because, under such circumstances, every one must be afraid lest his own idea should happen to be the only one of the kind, and therefore be deemed at once an 'out-of-the-way' one. On the other hand the perplexity of the committee is likely to be not at all less, when they come to sit in judgment upon, and have to make their selection from among a number of designs of so various a kind as hardly to admit of comparison. For this very reason alone it is highly desirable that there should be a public exhibition of the designs *before* any one be selected, in order that public opinion may be in some degree sounded, as to the kind of structure that ought to be adopted, and to elicit opinions from all sides. If perfect fairness, without anything approaching to trickery or delusion, be intended, surely such publicity ought rather to be courted than shunned; while, if it produced no other advantage, it would operate beneficially, first by giving an additional stimulus to men of talent, as they would be aware that if they displayed superior ability the merit of their designs could not fail to attract the notice of competent judges among the public, though it might fail to secure for them their main object; and secondly, by deterring many from entering the lists who must be conscious that theirs were ill-calculated to stand the test of a public scrutiny. Adverting once more to the embarrassment which, I think, it will be found the committee have subjected both themselves and the competitors, I must remark, that if the latter are left perfectly unfettered, they are at the same time left without anything whatever to guide them. Their designs may be for a temple, or a cenotaph, or a fountain, or a triumphal arch, or a column, or for a mere pedestal and statue upon it; or, in short, such is the latitude given for any ornamental structure, or display of sculpture, which will probably occasion many an old drawing of the kind to be dragged forth from its portfolio, and furbished up anew to serve as a Nelson Monument.

One thing, which most especially deserves to be considered, is the utter inadequacy of the sum to which the estimate is limited, for anything upon a grand scale, for any splendid array of sculpture and architecture. Either the monument must be very moderate as to size, or almost bare of decoration. The site naturally suggests a spreading substructure or platform, in some degree proportioned to the area in which the monument is to be erected;

but terraces with flights of steps, and ornamented parapets and pedestals, would swallow up nearly the whole funds, which being the case, I would suggest that it would be more prudent, on the part of the committee, to look, not so much to what can be effected at once with their present funds, as to what may be ultimately produced. Were a truly noble work commenced, one worthy of being considered a grand national trophy, I am inclined to believe that the public would come forward liberally with their contributions towards its completion; or, supposing that they niggardly refused to take a single farthing more out of their pockets for the purpose, I, for one, would much rather behold a magnificent plan to be left incomplete for another half century, than one on an inferior scale, and perhaps a decided failure, though fully terminated according to its design. The subject at least deserves to be most maturely considered by all who have our national credit in architecture at heart.

PRO CIVIBUS.

ARCHITECTURAL DICTIONARY.

Sir,—In the last number of your Magazine is a brief review of the Architectural Dictionary lately published under the editorial skill of Mr. Britton.

I am unwilling to trespass on your pages by any remarks which may appear suggested in the spirit of hypercriticism, or to make observations calculated to deter men of talent from offering to the profession the result of their researches, when such publication can reflect credit on the author, and confer benefit on the practitioner and student; but I must protest against the practice of book making instead of book writing, which certainly prevails at the present day, and it is in this spirit that I am induced to make my comments upon Mr. Britton's Architectural Dictionary.

I readily concede to Mr. Britton the credit of having *directed* many useful works, but this must not serve as a panoply to protect him when he undertakes a book professing to supply specific information, and either fails or neglects to fulfil this pledge.

A very palpable instance of this kind is evident in the Architectural Dictionary, a publication designedly brought forward to supply the deficiencies of former books of the kind.

You have already alluded to a few inexcusable omissions, and it is not difficult to prove a vast many others—a negligence the more remarkable, as Mr. B. seldom fails, in his prospectuses and prefaces, to relate the exertions and fatigues, with other personal matters to which he is subjected in compiling his books. It is certainly very doubtful whether any author ever equally exerted himself, or met with the like obstacles in his career, at least their prefaces have the good taste of being silent on such personal topics, leaving the volume of subject matter to testify what great toil and trouble must have been exerted by the compiler.

But I go to the work itself, which professes to supply the deficiencies of former Architectural Dictionaries,—*the inducement* that naturally leads those in possession of Stuart's Dictionary, Pugin's Works, with Willson's Glossary, and other recent glossaries, to possess themselves of Mr. Britton's book. As a student, I was desirous of making myself acquainted thoroughly with ancient terms now in frequent use, but I sought in vain for the following words under their initials:—Arras, Abbatoir, Badge, Blazoning, Battering, Bronze, Camber, Cramp, Cistern head, Cinque cento, Close, Discharging-arch, Dubbing, Flint-work, Filigree, Fleur-de-lis, Garth, Gussett, Guard-chamber, Handle, Husk, Linen-pattern, Lazar-house, Muniment-room, Medallion, Mask, Motto, Perforations, Pomegranate, Quartering, Ruby, Renaissance, Strawberry-leaf, Story-post, Stud-work, Scarfing, Saddle-bar, Wreath, Water-pipe. To these I could add many others, but I think the few mentioned come entirely within the province of an architectural dictionary; it cannot be said that they are insignificant in their meaning, and, therefore, unworthy of insertion, for this argument must exclude from the work many terms which are carefully explained.

It is readily granted that a complete dictionary of architectural terms is a difficult object to effect, but the classification under different heads, as you suggest, seems to offer the greatest probability of success, a scheme which would embrace not only ancient architecture, but the mechanical and other improvements of our own age, which require much exposition, since the application of science to purposes and objects not contemplated by our gifted ancestors has brought into action several classes of artificers, where formerly the mason and carpenter alone would have been engaged; and it should be the object of an architectural dictionary, of the nineteenth century, to furnish the professor and student with the peculiar technical terms used by each of these branches. Trusting that the day is not far distant when this desirable object will be undertaken by some competent person,

I remain, Sir, your obedient servant,

A CONSTANT READER.

[Several of these remarks had suggested themselves to us, but on recurring to one of the titles attached to the book, which styled it "A Dictionary of the Ancient Architecture of Great Britain," we did not feel ourselves justified in blaming Mr. Britton for his omission of articles relating to foreign medieval Architecture.]—Editor.

ON THE ARCHITECTURAL SOCIETY.

Sir,—As those who commit mischief are in duty bound to make all the reparation in their power, I hope that as you have narrated the vain squabbles of a T Square and a *Straight-edge*, you will not refuse to insert the peaceful exhortations of a *Set-square*.

T *Square*, then, should be first reproved, inasmuch as he gave the first provocation, viz., by stating, notwithstanding the secession of several of its members, among whom were Messrs. Wyatt, Walker, G. Moore, Owen Jones (the distinguished author of "La Alhambra"), Duesbury, and Ferrey*, that "the Architectural Society was still composed of those gentlemen who ever took its interests in their consideration, and supported it by their exertions, abilities, and funds," thus implying that the above gentlemen were mere cypers in the institution. His expression was a hasty one, and certainly an injudicious, if not an unjust one: for by provoking the calumniating reply of *Straight-edge*, the public trust and attachment to the society must be necessarily weakened. *Straight-edge*, however, should be treated with more marked displeasure, as his observations proceed from one who was formerly a member of the Society; otherwise, who could reckon themselves secure, when their nearest friends may, at a future time, become their deadliest enemies? He asks, in reply to T *Square*, "whether talent, or zeal, or liberality, or whether the circumstance of being amongst its earliest adherents, constitute the title to chieftaincy." Thus the injudicious remark of T *Square* is answered by *Straight-edge*, in words of even greater injustice and untruth. But *Straight-edge* is not satisfied here, but he next exhibits rancour and malice, in lieu of what should have been merely the feelings of a just resentment. After increasing the numerical strength of the seceding members, he goes on to state that "the numbers of the Architectural Society have decreased, and apathy usurped the place of that energy and spirit which was her strong ground." So far from this being the case, the list of members of the society is longer than it has ever been, and its resources in a more flourishing condition; so that they think of enlarging their rooms, and this even before the handsome presents to the society of 30l. from Mr. Tite, and 20l. from Mr. George Smith. The names of these gentlemen, with Messrs. I'Anson and Savage, were formally announced as having joined the Society on November 6, their first evening conversazione, notwithstanding his attempted intimidation.

He lastly endeavours to dissuade the public, "that ours is the profession of all others which possesses sufficient power and influence and is strong enough in the number of its followers, to admit of two societies being advantageously carried on." To this the rooms of each society bear sufficient proof. Besides, although the grand object of each is similar, the ways by which they strive to attain that object are very different; the Institute having, in fact, more claim to the title of a *society*, being composed only of those who have served the time of their articles in the profession; the Architectural Society, on the other hand, should rather be called *an Institute*, as one of its main objects is the forming a *school* of architecture for the younger members of the profession.

As the Architectural Society is thus steadily advancing, it is to be hoped that it will publish its Transactions at the end of the sessions (which it has hitherto only been prevented from doing, not from want of zeal or ability, but simply from want of finances), and then, laying claim to a charter and the Royal patronage, become a joint instrument with the Institute in directing the public taste, and in founding a National College of Architecture; when an architect will only be permitted to practice on his producing a diploma from each society; for it is only by mutual co-operation that this can be obtained.

Your obedient servant, SET-SQUARE.

[This communication must close the contention.—Editor.]

ON SETTING OUT SLOPES OF EXCAVATIONS AND EMBANKMENTS ON RAILWAYS.

Sir,—Seeing in the last number of your very excellent Journal, some remarks by Mr. Bruff on a method of setting out, on sidelong ground, the slopes of excavations and embankments, I have taken the liberty of suggesting another method, which in my opinion possesses some advantages over the one described by Mr. Bruff, in so far as it is more expeditious, and, taking into account the great liability to error in calculations made in the field, however simple and elementary they may be in themselves, also more accurate.

Fig. 1—Cutting.

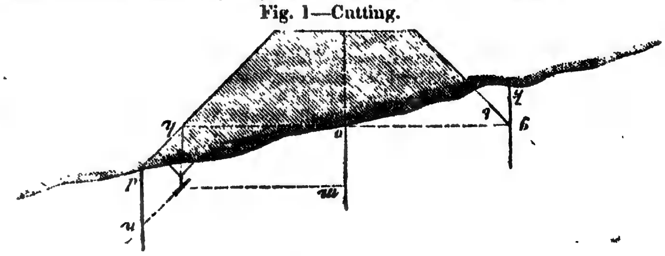


Fig. 2—Embankment.

* Mr. Johnson is still a member, being now in Italy, at the expense of the Royal Academy.

Fig. 1 represents a section of an excavation, in which *e f* is the surface of the ground and *o* the centre line of railway. The slopes being determined upon, had the ground been level, as *g ó h*, by measuring the distances *o g* and *ó h* on each side of the centre line, the tops of the slopes *g* and *h* would at once have been found.

Let, however, these distances be measured off and marked on the sloping ground at *k* and *s*; then, to find the top of the upper slope, place the *theodolite* at *s* and level to *m*, above the centre line; set the instrument now to the angle of the slope, and bring the staff to the higher ground, and move it about until you read the same height at *n* as you did at *m*. It is obvious, by inspecting the parallelograms *m h* and *h n*, that *d*, where the staff will then stand, is the point required.

To set out the lower slope requires the addition to the levelling staff of a leg, *g t*, capable of being set to any angle with the staff, and also of moving along it so as to be adjusted at any height. By placing the staff plumb at *k*, the leg being set to the angle of slope, and the top of it, *g*, on a level with *o*, it is clear that a line stretched along *g t*, and produced until it intersects the ground, will do so at the point *a*, which is the top of the slope required.

Fig. 2 is a section of an embankment which sufficiently explains itself. If you consider this of sufficient importance to merit a place in your useful miscellany, by inserting it you will oblige

Yours, &c.,

Halifax, November 19, 1838. DAVID W. BOWMAN, Engineer.

NEW ACT RELATING TO BUILDINGS.

The statute of 25 George III., c. 27, for the better regulation of buildings, and more effectually preventing mischief by fire, and by which a person was prohibited, in the penalty of 100*l*., from carrying on any manufactory for the distillation of turpentine, &c., in quantities above 10 gallons at a time, in any place within 75 feet of another building (except in buildings then in use for carrying on such manufactories), is repealed, so far as relates to the exception, by the act 1 and 2 Victoria, c. 39, passed at the close of last session; and the above penalty is declared to extend to the owner of any turpentine distillery within the distance of 75 feet from any other building, unless such other building adjoining the distillery be occupied jointly by the tenant of the latter, and the whole of such buildings (including the distillery and premises adjoining) be 75 feet distant from other buildings. The act contains, however, a proviso, that the proprietors of distilleries which have been in operation 30 years are not to be liable to the penalty until the 1st of August, 1840.

OVER ESTIMATES.

"They do these things better in France."—STERNE.

SIR,—We have heard a great deal from some parties about the defects of the English system of private engineering, and the advantage of a well organised government department. A great clamour has at the same time been raised, and much stress laid upon the excess which has taken place in most of the estimates for our English lines. The remedy is plain, according to these economists; but, as our fellow-countrymen may like to look before they leap, will you allow me to call their attention to the practical working of this superior system as exhibited in France, where great agitation now exists on the subject. In the case of the St. Germain Railway, the estimates of the Administration des Ponts et Chaussees amounted to only 6,000,000f. while the real expense exceeded 14,000,000f. In the same way the expenses of the Versailles and Meudon line have been estimated at only 5,000,000f., whereas it appears, to bring the line to Paris, 17 or 18,000,000f., at least, would be required. In the case of the Paris and Havre line, the estimate of this model Board of Works, instead of 90,000,000f., is expected to amount to 200,000,000f.

I leave these facts to speak for themselves, and the admirers of government boards to contemplate what they so much admire.

A FOE TO HUMBUG.

FRENCH MEASURES.

The following will be found simple methods of calculating, in round numbers, some of the French measures:—

To reduce English miles into metres, multiply by 16 and add two figures to the result, the true proportion is 1609.

To reduce metres into miles, cut off two figures and divide by 16.

To reduce yards into metres, multiply by 9 and cut off the last figure.

To reduce metres into yards, cut off the last figure and multiply by 11.

To reduce pounds sterling into francs, add two figures and divide by 4.

To reduce francs into pounds sterling, multiply by 4 and add two figures.

These rules will be found with all ordinary numbers to give a result within one per cent. of the truth.

GUILDHALL.

SIR,—As the City authorities have been making an alteration in Guildhall, by rendering the east end similar in style to the west, and decorating it with the statues of Edward VI., Queen Elizabeth, and Charles I., rescued from the coal cellar, may I be permitted, through the medium of your influential journal, to submit to the civic authorities another improvement. Some time ago, there was exhibited in the Hall some ancient tapestry and pictures, which are again consigned to oblivion and destruction in their former receptacles. Now, what I should beg leave to suggest is, that some of these objects might be well exhibited in the vaulted passage leading into the Hall from Basinghall-street, and which could be protected from injury by payment of a very small amount out of the 2,000*l*. per annum paid for watching the Hall. It was in a somewhat similar way that the French have used the temporary wooden galleries erected at the Louvre for a ball, as a place for the exhibition of their collection of tapestry. Yours, &c.,

A CONSTANT READER.

REPORT ON INTERNAL COMMUNICATION TAXATION.

The committee, after showing the great inequality which exists, steam boats paying nothing, railways ⅛d. per passenger per mile, stage coaches ½d., and post masters ¾d., recommends the abolition of all such taxation at the earliest possible period, and that, in the meanwhile, steam boats, railways, and stage coaches, should be charged one halfpenny per passenger duty for every four miles. In the evidence taken before the committee, Mr. Horne, the coach proprietor, states that great difficulty is sustained by the coachmasters on all lines of road where they are affected by steam navigation, as the east of England, as far as York and Edinburgh. Mr. Horne does not think that with a reduction of duties, nor without an abolition of tolls, that the stage coaches could come into competition with railways. He states that a similar effect is felt in Kent, but that coaches are started after October, on account of the bad weather. Mr. Robert Gray states, that were the post-chaise duty taken off, a great number would be kept by country innkeepers to convey passengers to the railways.

To this report is appended a return of the amount of mileage duty and composition paid by 18 working railway companies; among which, for the year 1837, are the Manchester, 7,485*l*.; Leeds and Selby, 2,235*l*.; Greenwich, 451*l*.; and the others various amounts, from 250*l*. and under. The total amount of duty was 10,296*l*., or one-fiftieth of the stage coach duties.

CITY IMPROVEMENTS.

SIR,—The city Commissioners of Pavements have recently erected disgusting stone lamp-spikes at each end of Cheapside, but I submit that their places might well have been occupied in another way. The city which can raise tens of thousands for a statue to the Duke of Wellington, could very easily have erected a statue to Milton near his birth-place, Bread-street, and another to Pope, near Lombard-street; at least they might have dedicated columns to their memory, as they have done in Farringdon-street, to two brawling politicians. All that has been done to commemorate Milton in the place of his nativity has been to dedicate Grub-street to his name.

A. C.

CHIMNEYS.

(From Dr. Ure's Dictionary of Arts, Manufactures, and Mines.)

Chimney is a modern invention for promoting the draught of fires and carrying off the smoke, introduced into England so late as the age of Elizabeth, though it seems to have been employed in Italy 100 years before. The Romans, with all their luxurious refinements, must have had their epicurean cookery placed in perpetual jeopardy from their kitchen fires, which, having no vent by a vertical tunnel in the walls, discharged their smoke and frequently their flames at the windows, to the no small alarm of their neighbours, and annoyance of even the street passengers.

Chimneys in dwelling houses serve also the valuable purpose of promoting salubrious circulation of air in the apartments, when not foolishly sealed with anti-ventilating stove-chests.

The first person who sought to investigate the general principles of chimney draughts, in subserviency to manufacturing establishments, was the celebrated Montgolfier. As the ascent of heated air in a conduit depends upon the diminution of its specific gravity, or, in other words, upon the increase of its volume by the heat, the ascensional force may be deduced from the difference between the density of the elastic fluid in the interior of the chimney, and of the external air; that is, between the different heights of the internal and external columns of elastic fluid supposed to be reduced to the same density. In the latter case, the velocity of the gaseous products of combustion in the interior of the chimney is equal to that of a heavy body let fall from a height equal to the difference in height of the two aerial columns.

To illustrate this position by an example, let us consider the simple case of a chimney of ventilation for carrying off foul air from a factory of any kind; and suppose that the tunnel of iron be incased throughout with steam at 212 degrees Fahr. Suppose this tunnel to be 100 yards high, then the weight of the column of air in it will be to that of a column of external air 100 yards high, assumed at 32° F. inversely as its expansion by 180°; that is, as 1000 is to 1·375; or as 72·727 is to 100. The column of external air at 32° being 100 yards, the internal column will be represented by 72·727; and the difference $= 27{\cdot}27$, will be the amount of unbalanced weight or pressure, which is the effective cause of the ventilation. Calculating the velocity of current due to this difference of weight by the well-known formula for the fall of heavy bodies, that is to say, multiplying the above difference, which is 27·27, by the constant factor 19·62, and extracting the square root of the product; thus, $\sqrt{19{\cdot}62 \times 27{\cdot}27} = 23{\cdot}13$ will be the velocity in yards per second, which, multiplied by 3, gives 60·30 feet. The quantity of air which passes in a second is obtained of course by multiplying the area or cross section of the tunnel by this velocity. If that section is half

a yard, that is = a quadrangle $2\frac{1}{4}$ feet by 2, we shall have $23{\cdot}13 \times 0{\cdot}5 = 11{\cdot}565$ cubic yards, $= 312\frac{1}{4}$ cubic feet.

The problem becomes a little more complicated in calculating the velocity of air which has served for combustion, because it has changed its nature, a variable proportion of its oxygen gas of specific gravity 1·111, being converted into carbonic acid gas of specific gravity 1·524. The quantity of air passed through well-constructed furnaces may, in general, be regarded as double of what is rigorously necessary for combustion, and the proportion of carbonic acid generated, therefore, not one half of what it would be were all the oxygen so combined. The increase of weight in such burned air of the temperature of 212°, over that of pure air equally heated, being taken into account in the preceding calculation, will give us about 19 yards or 57 feet per second for the velocity in a chimney 100 yards high incased in steam.

Such are the deductions of theory; but they differ considerably from practical results, in consequence of the friction of the air upon the sides of the chimneys, which varies likewise with its form, length, and quality. The direction and force of the winds also exercise a variable influence upon chimney furnaces differently situated. In chimneys made of wrought iron, like those of steam boats, the refrigeration is considerable, and causes a diminution of velocity far greater than what occurs in a factory stalk of well-built brick-work. In comparing the numbers resulting from the trials made on chimneys of different materials and of different forms, it has been concluded that the obstruction to the draught of the air, or the deduction to be made from the theoretical velocity of efflux, is directly proportional to the length of the chimneys and to the square of the velocity, and inversely to their diameter. With an ordinary wrought-iron pipe, of from 4 inches to 5 inches diameter, attached to an ordinary stove, burning good charcoal, the difference is prodigious between the velocity calculated by the above theoretical rule, and that observed by means of a stop-watch, and the ascent of a puff of smoke from a little tow, dipped in oil of turpentine thrust quickly into the fire. The chimney being 45 feet high, the temperature of the atmosphere, 68° Fahr., the velocity per second was,—

Trials.	By theory.	By experiment.	Mean temperature of chimney.
1	26·4 feet	5 feet	190° Fahr.
2	29·4	5·76	214
3	34·5	6·3	270

To obtain congruity between calculation and experiment, several circumstances must be introduced into our formulæ. In the first place, the theoretical velocity must be multiplied by a factor, which is different according as the chimney is made of bricks, pottery, sheet iron, or cast iron. This factor must be multiplied by the square root of the diameter of the chimney (supposed to be round), divided by its length, increased by four times its diameter. Thus, for pottery, its expression is $2{\cdot}06\sqrt{\frac{D}{L+D}}$; D being the diameter, and L the length of the chimney.

A pottery chimney, 33 feet high, and 7 inches in diameter, when the excess of its mean temperature above that of the atmosphere was 205° Fahr., had a pressure of hot air equal to 11·7 feet, and a velocity of 7·2 feet per second. By calculating from the last formula, the same number very nearly is obtained. In none of the experiments did the velocity exceed 12 feet per second, when the difference of temperature was more than 410° Fahr.

Every different form of chimney would require a special set of experiments to be made for determining the proper factor to be used.

This troublesome operation may be saved by the judicious application of a delicate differential barometer, such as that invented by Dr. Wollaston; though this instrument does not seem to have been applied by its very ingenious author in measuring the draughts or ventilating powers of furnaces.

If into one leg of this differential syphon, water be put, and fine spermaceti oil into the other, we shall have two liquids, which are to each other in density as the numbers 8 and 7. If proof spirit be employed instead of water, we shall then have the relation of very nearly 20 to 19. I have made experiments on furnace draughts with the instrument in each of these states, and find the water and oil syphon to be sufficiently sensible: for the weaker draughts of common fire-places the spirits and oil will be preferable barometric fluids.

To the lateral projecting tube of the instrument, as described by Dr. Wollaston, I found it necessary to attach a stop-cock, in order to cut off the action of the chimney, while placing the syphon, to allow of its being fixed in a proper state of adjustment, with its junction line of the oil and water at the zero of the scale. Since a slight deviation of the legs of the syphon from the perpendicular changes very considerably the line of the level, this adjustment should be made secure by fixing the horizontal pipe tightly into a round hole, bored into the chimney stalk, or drilled through the furnace door. On gently turning the stop-cock, the difference of atmospherical pressure corresponding to the chimney draught, will be immediately indicated by the ascent of the junction-line of the liquids in the syphon. This modification of apparatus permits the experiment to be readily rectified by again shutting off the draught, when the air will slowly re-enter the syphon; because the projecting tube of the barometer is thrust into the stop-cock, but not hermetically joined; whereby its junction line is allowed to return to the zero of the scale in the course of a few seconds.

Out of many experiments made with this instrument, I shall content myself with describing a few, very carefully performed at the breweries of Messrs. Truman, Hanbury, and Buxton, and of Sir H. Meux, Bart., and at the machine factory of Messrs. Braithwaite; in the latter of which I was assisted by Captain Ericsson. In the first trials at the breweries, the end of the stop-cock attached to the differential barometer was lapped round with hemp, and made fast into the circular peep-hole of the furnace door of a wort copper, communicating with two upright parallel chimneys, each 18 inches square, and 50 feet high. The fire was burning with fully its average intensity at the time. The adjustment of the level being perfect, the stop-cock orifice was opened, and the junction level of the oil and water rose steadily, and stood at $1\frac{1}{4}$ inches corresponding to $\frac{1{\cdot}25}{8} = 0{\cdot}156$ of 1 inch of water, or a column of air 10·7 feet high. This difference of pressure indicates a velocity of 26 feet per second. In a second set of experiments the extremity of the stop-cock was inserted into a hole, bored through the chimney stalk of the boiler of a Boulton and Watt steam-engine of twenty-horse power. The area of this chimney was exactly 18 inches square at the level of the bored hole, and its summit rose 50 feet above it. The fire-grate was about 10 feet below that level. On opening the stop-cock, the junction line rose $2\frac{1}{4}$ inches. This experiment was verified by repetition upon different days, with fires burning at their average intensity, and consuming fully 12lbs. of the best coals hourly for each horse's power, or nearly one ton and a third in twelve hours. If we divide the number $2\frac{1}{4}$ by 8, the quotient 0·28 will represent the fractional part of 1 inch of water, supported in the syphon by the unbalanced pressure of the atmosphere in the said chimney; which corresponds to $19\frac{1}{4}$ feet of air, and indicates a velocity in the chimney current of 35 feet per second. The consumption of fuel was much more considerable in the immense grate under the wort copper, than it was under the steam-engine boiler.

In my experiments at Messrs. Braithwaite's factory, the maximum displacement of the junction line was 1 inch, when the differential oil and water barometer was placed in direct communication with a chimney 15 inches square, belonging to a steam boiler, and when the fire was made to burn so fiercely, that, on opening the safety-valve of the boiler, the excess of steam beyond the consumption of the engine, rushed out with such violence as to fill the whole premises. The pressure of one-eighth of an inch of water denotes a velocity of draught of 23·4 feet per second.

In building chimneys, we should be careful to make their area rather too large than too small; because we can readily reduce it to any desired size, by means of a sliding register plate near its bottom, or a damper plate applied to its top, adjustable by wires or chains, passing over pulleys. Wide chimneys are not so liable as narrow ones to have their draught affected by strong winds. In a factory, many furnace flues are often conducted into one vertical chimney stalk, with great economy in the first erection, and increased power of draught in the several fires.

Vast improvements have been made in this country, of late years, in building stalks for steam boilers and chemical furnaces. Instead of constructing an expensive, lofty scaffolding of timber round the chimney, for for the bricklayers to stand upon, and to place their materials, pigeon-holes, or recesses, are left at regular intervals, a few feet apart, within the chimney, for receiving the ends of stout wooden bars, which are laid across, so as to form a species of temporary ladder in the interior of the tunnel. By means of these bars with aid of ropes and pulleys, everything may be progressively hoisted, for the building of the highest engine or other stalks. An expert bricklayer, with a handy labourer, can in this way raise, in a few weeks, a considerable chimney, 40 feet high, 5 feet 8 inches square outside, 2 feet 8 inches inside at the base, 28 inches outside, and 20 inches inside at the top. To facilitate the erection, and at the same time increase the solidity of an insulated stalk of this kind, it is built with three or more successive plinths, or recedures, as shown in *fig.* 281. It is necessary to make such chimneys thick and substantial near the base, in order that they may sustain the first violence of the fire, and prevent the sudden dissipation of the heat. When many flues are conducted into one chimney stalk, the area of the latter should be nearly equal to the sum of the areas of the former, or at least of as many of them as shall be going simultaneously. When the products of combustion from any furnace must be conducted downwards, in order to enter near the bottom of the main stalk, they will not flow off until the lowest part of the channel be heated by burning some wood shavings or straw in it, whereby the air syphon is set agoing. Immediately after kindling this transient fire at that spot, the orifice must be shut by which it was introduced; otherwise the draught of the furnace would be seriously impeded. But this precaution is seldom necessary in great factories, where a certain degree of heat is always maintained in the flues, or, at least, should be preserved, by shutting the damper plate of each separate flue, whenever its own furnace ceases to act. Such chimneys are finished at top with a coping of stone-slabs, to secure their brickwork against the infiltration of rains, and they should be furnished with metallic conducting rods, to protect them from explosions of lightning.

COMPANION TO THE ALMANAC FOR 1839.

Reserving a fuller notice of this publication for our next Number, we shall merely state at present that the architectural section is more copiously illustrated than usual, and that the wood cuts manifest considerable improvement. Among them are a view of the Athenæum, Hotel, &c., at Derby; a view and ground plan of the Victoria Rooms, Bristol; a section of the Fitz-william Museum, Cambridge; and a view of the new London and Westminster Bank; all which subjects, as well as many others, are fully described in the letter-press.

COLES' PATENT ANTI-FRICTION RAILWAY CARRIAGES.

Fig. 1.—Perspective View of a Carriage.

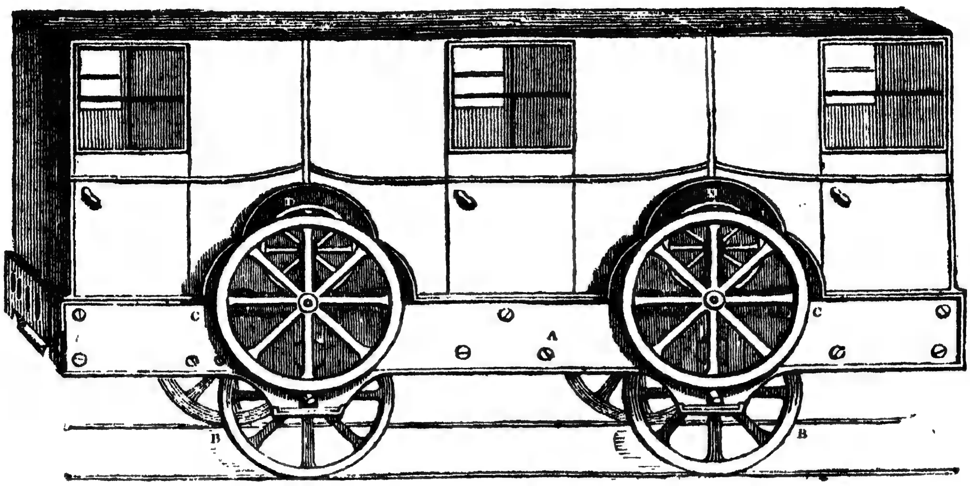


Fig. 2.—Plan of the Carriage Framing.

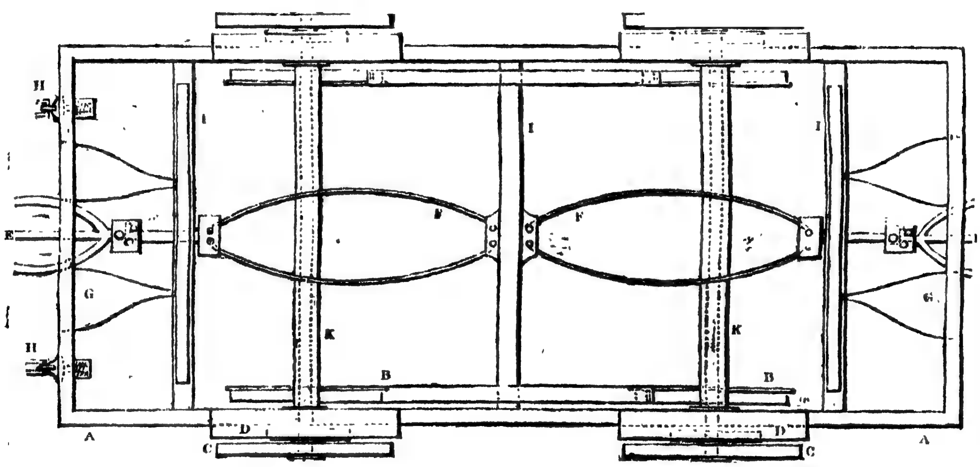
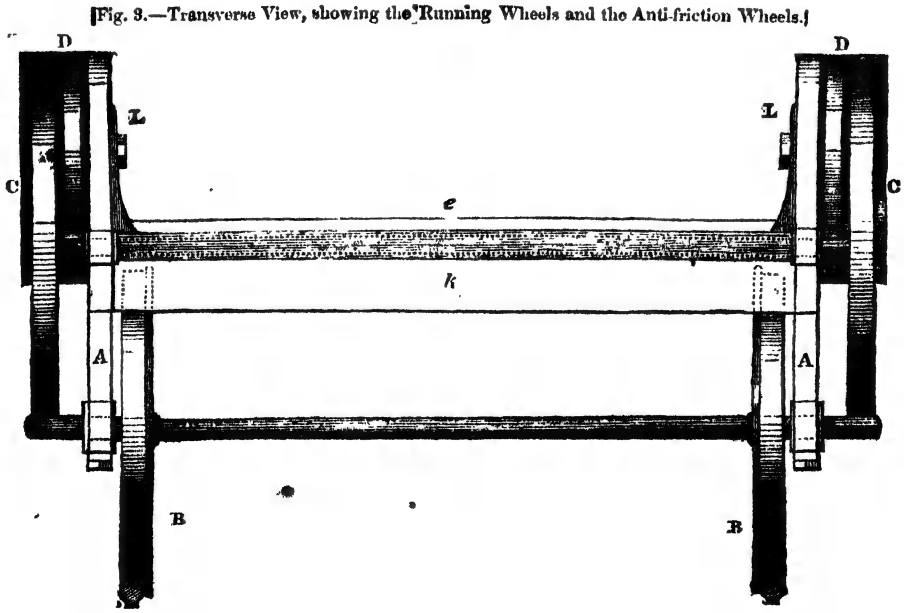


Fig. 3.—Transverse View, showing the Running Wheels and the Anti-friction Wheels.



COLES' PATENT ANTI-FRICTION WHEEL RAILWAY CARRIAGES.

In a former number of the Journal (No. IX., p. 226) an engraving and short description of the above carriages were given. I now forward some additional drawings and description, which will better illustrate the construction of the carriages and the application of the anti-friction wheels, and the buffing apparatus.

"The object of my invention or improvement in carriages, more particularly for railways or tramroads, is, in the first place, to reduce the friction upon the axles of the wheels on the rails, and by the introduction of two-wheel carriages, prevent that contact when turning curves upon the rail, to which four-wheel carriages are always liable; secondly, to ameliorate the effects of concussions of such carriages one against the other. The former consists in a novel or improved arrangement of anti-friction wheels or rollers, which bear upon the axles of each other, thereby transferring the weight of the body and its contents from the axle of the quickest motion to that of the slow motion; whilst the latter consists in an improved construction and arrangement of elliptic spring buffers and spring fastenings to connect the same, for the purpose of reducing or ameliorating the concussion of one carriage against the other, or of the engine or tender: all of which improvements are exhibited in the accompanying engravings, as applicable to two-wheel or four-wheel carriages.

Fig. 1 is a perspective view of a four-wheel railway carriage, with my improvements applied thereto; fig 2 is a plan or horizontal view of the carriage-framing of the same; fig. 3 represents a transverse view of the wheels: A A is the framing of the carriage; B B, the running wheels, having anti-friction wheels C C bearing upon their axle; D D are smaller anti-friction wheels bearing upon the axles of C C. The axles of the upper wheels are fixed, and do not revolve with the wheels. The middle and lower axles, with their boxes or collars, work up and down in a groove of the framework of the carriage. The whole weight of the load and frame is borne off by the upper friction wheels: E E are strong iron bars, which pass through each end of the carriage, and are bolted or attached to an iron which passes through one cross stay, and is thereby connected to the spring buffer; which buffer is also affixed to a similar iron attached to the other cross stay, against which the spring buffers are protected from being too much compressed or elongated, care being taken to allow sufficient room for the action of the springs either way; F F, the spring buffers; G G are two springs, fixed in the cross stay, and pressing against the connecting rod to keep it in a straight line to receive the bolt which connects the carriages; H H are two dovetail irons fitted into grooves, with chain to each; and also a bolt, which passes through the end of the carriage and through a coiled spring fitted into a box for that purpose, and connected to the next carriage. This mode of attaching the carriages renders them secure and flexible, and when pulling sideways have always two bearings to draw from, and when going straightforward, three; I I I are three cross stays, to which the springs and the spring buffers are attached; K K are two circular tubes, forming also stays, under which the middle axle works, and through the ends of which the upper axles are screwed and bolted; L L are two supports for the upper axles, to confine the wheels in their place, with screws to fix them.

"The two-wheel carriage differs from that above described, by having only two cross stays and one spring buffer; the axle of the upper wheels passes through the body of the carriage, and likewise forms a stay for the upper part of the frame.

"I claim, as my invention or improvement in carriages, the novel and peculiar adaptation of the mode of employing the friction wheels; and, thirdly, the peculiar adaptation of spring buffers and spring fastenings, as shown in the above drawings, or otherwise.

Having given the above description, I will now point out what I consider the advantages of my patent. It will be seen, by reference to the drawings, that the running wheels, and also the large anti-friction wheels, have only the friction of the collar, weighing about eight or ten pounds, whereas, in the common carriage, the friction of the whole, weighing from four to five tons, is thrown on the axle of the running wheels, which often produces such a great heat as to cause the axle to enlarge and the orifice of the collar to contract, no matter whether the collar be in one piece or in parts, thereby preventing the oil passing between the surfaces to lubricate the bearings. This is a very frequent occurrence when travelling at a great speed, and obliges the engineer to keep a good look-out to check the velocity of the train, when such an occurrence is likely to take place, so as to prevent any serious accident. The axle and collar may become so united by friction as to prevent the wheel revolving; but that never can be the case with the anti-friction wheels, even if the carriages were propelled five times faster than one with common bearings; moreover, the motion of the large anti-friction wheels, supposing they had to sustain the friction of the whole weight of the carriage, would be ten times less than the running wheels; but, when the whole weight is borne by the upper friction wheels the motion is only one-sixtieth part, and the heat produced, most probably, would not be one-thousandth part as great as that of the running wheels; consequently, the saving in oil or grease would be very great, notwithstanding that the bearings are as three to one.

A model may be seen of a carriage with the anti-friction wheels, propelled at the speed of seventy miles an hour. Here there is a weight equal to three ounces as a propelling power when the anti-friction wheels are in action, while a power of eighteen or twenty ounces is required when they are out of action, and the friction of the whole weight is thrown on the axle of the running wheels; and whether the weight be reduced or increased, the same proportion of propelling power will be necessary to give the carriage motion. Therefore, by reducing the friction of the carriages to one-sixth part, the engine or propelling power will be enabled to draw an increased load, as six to one; or, in other words, an engine of one-sixth the power will be capable of propelling the same load.

3, Charing-cross. W. COLES.

CORNISH STEAM ENGINES.

ON THE EFFECTIVE POWER OF THE HIGH PRESSURE EXPANSIVE CONDENSING ENGINES IN USE AT SOME OF THE CORNISH MINES. BY THOMAS WICKSTEED, M.INST.C.E., COMMUNICATED IN A LETTER TO THE PRESIDENT OF THE INSTITUTION OF CIVIL ENGINEERS.

I am induced to address you again* upon the subject of the engines used in the mines in Cornwall, from the very kind manner in which you received my last paper.

I have been lately into Cornwall, having been instructed by the Directors of the East London Water Works Company to proceed there for the purpose of examining an engine that was to be disposed of by the East Cornwall Silver Mining Company, with a view of purchasing it for the company's works at Old Ford. The result was, that the engine, whose cylinder was 80 inches in diameter, was purchased, and is now being removed to London, and I expect that by this time next year it will be at work here.

While in Cornwall, I was very desirous of making such a trial of one of the engines as might be satisfactory to the London engineers, and trust that I have succeeded in my object.

I received permission to make a trial of the engine upon the Holmbush Mines near Callington, and beg to give you the following detailed account thereof.

The diameter of the cylinder was fifty inches; the sizes of the pumps, or "boxes," as they are termed in Cornwall, and the height of the lifts, are as follows, viz:—

	Fath.	ft.	in.		
Tye lift - - -	42	2	6	Diameter of pump -	11 inches.
Rose lift - - -	37	5	6	Ditto - - - - - -	11 „
Bottom lift - -	8	5	6	Ditto - - - - - -	10 „

The chief points to which my attention was directed, were the quantity of coals consumed, and the actual quantity of water lifted.

I saw 94lbs. (a Cornish bushel) of coals weighed, and had the stoke-hole cleared, and the coal bins and stoke hole doors sealed; and in addition to these precautions, besides my own observation, I had one of my young men stationed in the boiler-house during the time of trial, so that I am quite satisfied that no more than 94lbs. of coals were used.

Before the trial I ascertained exactly the length of the pump stroke, which was eight feet one inch, and caused the engine to work slowly that I might have sufficient time to measure the quantity of water delivered per stroke. The water was delivered into a wooden cistern, with a valve to let the water out when I had measured it. Finding that six separate measurements produced as nearly as possible the same result, the greatest variation being 2 per cent., I then weighed the quantity of water delivered by each stroke, and found it to be equal to $285\frac{6}{10}$lbs. I had a rod made the exact length of the stroke, namely, 8 feet 1 inch, and during the trial measured the stroke frequently; it varied from 8 feet 1 inch to 8 feet 2 inches. I have in my calculations taken the shortest length.

The diameters of the pumps, and the exact heights of the lifts, were taken very carefully.

TRIAL.

The fire under the boiler was worked down as low as could be without stopping the engine. The pressure of steam was 40lbs. per square inch *in the boiler;* I took the counter and the time, and then started the engine. At the end of 2¼ hours the fire was lowering, and the speed of the engine reducing, and it was necessary to have more fuel. The 94lbs. of coal having been consumed, the engine was then stopped, and the counter again taken. It had made 672 strokes, or very nearly 5 strokes per minute. The weight of water raised was (285·6lbs. × 672 strokes =) 191,823·2lbs.; the height to which it was raised (was 42fath. 2ft. 6in. + 37fath. 5ft. 6in. + 8fath. 5ft. 6in.) = 535ft. 6in. the weight multiplied by the height in feet is equal to 102,721,323lbs. of water lifted one foot high with 94lbs. of coals.

This result, however, although it shows how much water was actually

* For previous communication, see Vol. I. of the Transactions of the Institution of Civil Engineers.

raised to the surface, does not show the duty of the engine, for although, in consequence of leaks and defective valves the quantity raised is not so great as it would be were it possible to have every part perfect, nevertheless the engine has to raise the quantity due to the areas of the pumps, multiplied by the length of the stroke, under the pressure due to the columns of water equal in height to the lifts, notwithstanding that in consequence of the defects mentioned, the whole quantity may not reach the surface; the fair mode, therefore, of calculating the duty of the engine, during the trial, would be as follows:—

	lbs.
Weight of column of water 11 inches diameter, and 42fath. 2ft. 6in., or 254·5 feet in height	10,498
Ditto - - ditto - - 11 inches diameter, and 37fath. 5ft. 6in., or 227·5 feet in height	9,384
Ditto - - ditto - - 10 inches diameter, and 8fath. 5ft. 6in., or 53·5 feet in height	1,824
Load upon engine	21,706

21,706 × 672 strokes × stroke $8\frac{1}{12}$ feet = 117,906,992lbs. weight lifted one foot high with 94lbs. of coals.

From the foregoing it will be seen that 191,823lbs. of water, were raised 535 feet 6 inches high with the expenditure of 94lbs. of coals, and that the duty of the engine was equal to nearly 118 millions of pounds raised one foot high. I should observe, that the engine had not been overhauled, or any thing done to it to prepare for the trial, which was not determined upon (as regarded the engine upon which the trial was to be made), until the previous day. The boiler and flues had not been cleaned for eleven months.—My object was to prove what could be done by an engine worked upon the expansive principle, and I therefore considered that a trial for two hours would prove the capability of the engine, although, most probably, the average duty of the engine for twelve months would not be so great as it was for the short time that it was under trial. I am perfectly satisfied the trial was a fair one.

I was not able to ascertain what the pressure of steam was when it first entered the cylinder, having no indicator with me; but the engineer, Mr. West, stated that the steam was wire drawn and reduced from 40lbs. above the atmosphere, which was the pressure in the boiler, to 30lbs. above the atmosphere upon entering the cylinder.

The steam was cut off at one-sixth the stroke. The steam in the jacket round the cylinder communicates directly with the boiler, and radiation is completely prevented, by the casing round the jacket; consequently a high temperature is preserved, which is absolutely necessary to obtain the full effect from the expansive force of the steam.

The following will show what effect could have been produced by the steam power, provided the engine and pump gear had worked *without* friction.

Pressure of steam when first admitted into the cylinder (30lbs. + 14·75lbs. —1·5lbs. deducted for imperfect vacuum) = 43·25lbs.

		lbs.	
For $\frac{1}{6}$ of the stroke, the pressure was		43·250	per square inch.
When the piston had made $\frac{2}{6}$ of its stroke the pressure was reduced to		21·625	
Ditto	$\frac{3}{6}$	14·416	
Ditto	$\frac{4}{6}$	10·812	
Ditto	$\frac{5}{6}$	8·650	
Ditto	$\frac{6}{6}$	7·208	
		6)105·961	
Mean pressure of steam		17·66lbs.	

The area of cylinder was	1963·5 square inches.
Mean pressure of steam per square inch	17·66lbs.
Number of strokes	672
Length of stroke in cylinder (being one foot longer than in shaft)	9ft. 1in.

Power of steam 1963·5 sq. in. × 17·66lbs. per sq. in. × 672 strokes × $9\frac{1}{12}$, length of stroke, = 211,658,702lbs. raised 1 foot high with 94lbs. of coals; now as the effect produced was 117,906,992, the friction of the machinery was equal to 93,751,710lbs. raised 1 foot high, or about $7\frac{3}{4}$lbs. pressure per square inch. As the friction of a water-works pumping engine is about $5\frac{3}{4}$lbs. per square inch, it may be safely inferred, that an engine when working upon the expansive principle at a water-works will do more work than it does in the mines; to those who have seen the heavy pump rods, balance bobs, &c., attached to a mining engine, it will appear very evident.

In the observations I have had opportunities of making, I am very well satisfied that the engine I am about to erect at the East London Water-Works will do a duty equal to at least 120 millions.

As it had been observed that the expansive principle would not answer for rotary or double engines, I was induced to make some observations upon a double engine working the stamps for breaking the copper ores at the Tincroft Mines, and I beg leave to give you the details.

The diameter of cylinder	36 inches.
Length of stroke	9 feet.
Length of crank	3 feet 6 inches.
Steam was cut off in down-stroke at	$\frac{4}{5}$ths.
Ditto - - - - - up-stroke at	$\frac{1}{3}$rd.
Number of strokes per minute	10

The engine worked with a very equal velocity, in fact there appeared no irregularity whatever in the motion; Captain Paul, the agent of the mine, allowed me to examine the coal accounts, from which it appeared, that the average consumption of coals for the engine was 30 bushels for 24 hours.

The engine was working,—1st, a set of stamps; 2nd, a pump; 3rd, a crushing machine: and 4th, a trunking machine. The last two pieces of machinery had lately been added, and previous to this increase of machinery, it appeared from the books, that the consumption of coals was equal to 27 bushels, of 93lbs. each, in 24 hours.

The stamping machinery worked 48 lifters; to ascertain the weight of them, I examined an account showing the weight of 26 of the cast iron heads when new, and found the average weight to be 3 cwt. 12lbs. each, these are used until the weight by wear is reduced to 1 cwt. 2 qrs., the average weight will therefore be (3 cwt. 12lbs. + 1 cwt. 2 qrs. ÷ 2) = 2 cwt. 1 qr. 6lbs. The weight of the wood work of the lifter, the iron straps, washers, &c., I found by trial to be 1 cwt. 3 qrs. 24lbs., making the total average weight of the lifter and head (2 cwt. 1 qr. 6lbs., + 1 cwt. 3 qrs. 24lbs.) = 4 cwt. 1 qr. 2lbs. or 478lbs. The average height the stamps were lifted was 10 inches, and the 48 stamps were lifted 5 times per stroke.

The following calculations will show the duty performed by the stamping engine.

48 lifters × 478lbs. × 0·833 feet, height lifted, × 5 times per stroke × 10 strokes per minute, × 60 minutes per hour, × 24 hours per diem, 1,376,089,344 lbs. lifted one foot high in 24 hours.

The diameter of the pump was	14 inches, or 1·069 sq. ft. area.
Length of stroke	6 feet.
Strokes per minute	10
Lift	26 feet.

Duty performed 1·069 sq. ft. × 6 ft. × $62\frac{1}{2}$lbs. per cubic ft., × 26 ft. lift × 10 strokes per minute, × 60 minutes × 24 hours = 150,087,600lbs. raised one foot high in the 24 hours.

DUTY OF ENGINE.

1,376,089,344 = 150,087,600 ÷ 27 bushels = 56,525,072lbs. lifted one foot high, with a bushel or 93lbs of coals.

The single engine at the Holmbush mine was, during the time of my experiment, doing the work of 26·48 horses; thus the experiment lasted $2\frac{1}{4}$ hours, or 135 minutes × 33,000lbs., lifted 1 foot = 4,455,000lbs., which would be lifted 1 foot high by the exertion of 1 horse's power in $2\frac{1}{4}$ hours. 117,906,992lbs., ÷ 4,455,000 = 26·48 horses' power. The coals consumed were equal to 94lbs. or (94lbs. ÷ 26·48 horses' power ÷ 2·25 hours) = 1·57lbs. of coals per horse's power per hour. The coals used by one of the pumping engines at Old Ford in an experiment lasting 1 hour, tried upon the 18th of February 1835, were equal to 4·82lbs. per hour per horse's power, or three times the consumption of the Cornish engine, notwithstanding the extra friction in a mining engine.

The double engine at the Tincroft mines was doing the work of 32·11 horses; thus 33,000 × 60 minutes × 24 hours = 47,520,000lbs. lifted 1 foot high by the exertion of one horse's power during 24 hours. The engine lifted 1,526,176,944lbs. 1 foot high in the 24 hours; 1,526,176,944 ÷ 47,520,000 = 32·11 horses' power. The coals consumed were 27 bushels of 93lbs. each, or 2,511lbs. ÷ 24 = 104·62lbs, per hour ÷ 32·11 horses' power = 3·25 lbs. of coals per hour per horse's power.

Mr. Farey, in his valuable treatise on the steam engine, states at page 488, that a rotary or double engine of Bolton and Watt's construction, will require $10\frac{1}{2}$lbs. of coals per hour per horse's power, or three times the consumption of the Tincroft double engine.

Old Ford, Aug. 7, 1837. THOMAS WICKSTEED.

MORECAMBE BAY EMBANKMENT.

To Sir H. Le Fleming Senhouse, and the Gentlemen forming the Provisional Committee of the "Caledonian, West Cumberland, and Furness Railway."

Gentlemen,—In obedience to instructions received from you in February last, I examined Morecambe Bay and the Dudden Sands, for the purpose of determining the most eligible points, and ascertaining the practicability of carrying railway embankments across those estuaries, and diverting the courses of the rivers; and in a letter addressed to Sir H. Le Fleming Senhouse, in March last, I briefly stated my opinion upon the subject. Since then, having received more particular instructions to survey, and give in plans and estimates of the expenses, and report my opinion as to the best mode of forming those embankments, and diverting the rivers, with the view to the formation of a company, and an application to Parliament to carry those objects into effect, I now beg to lay before you the result of my labours.

Having obtained the assistance of Mr. Padley, of London, who has had much experience in making surveys and taking levels for railways, I, early in June, commenced my operations. I first inspected the terminus of the Preston and Lancaster Railway, at Lancaster, and examined the intervening country to Morecambe Bay, in order to fix upon the most desirable line of railway from Lancaster, and the best point for the embankment to cross the bay. I then examined the eastern shores of the bay, and took such levels of the sands, and trials of the substrata, as I considered necessary; proceeding round the bay, viewing the entrance of the rivers and streams falling into it, and the surrounding country to Ulverstone. At Ulverstone I made inquiries respecting the trade of that port and the other places round the bay, and as to the local interests generally, to learn, as far as pos-

sible, to what extent those interests might be affected by the intended embankment and railway, and the diversion of the channels and rivers. I then examined the eastern shores and sands of Morecambe Bay, from Ulverstone to Rampside, and the peninsula of Low Furness, lying between Morecambe Bay and the Duddon, and round the Duddon sands by Ireleth and Broughton, to the south-westernmost point at Hodbarrow. After these preliminary steps, I commenced taking levels, soundings, and measurements, on the Duddon, to ascertain the distances, the height of the tides, the depth of water, and, from borings, the nature of the substrata under the sands. I then proceeded in the same manner with my surveys, measurements, levels, soundings and borings, on Morecambe Bay.

Upon a careful examination and consideration of all the circumstances and localities, I am of opinion, that the object the committee have in view is perfectly feasible, and that there is not any difficulty in an engineering point of view, in carrying a railway across these two bays. I recommend that the railway should commence at the terminus of the Lancaster and Preston line, proceeding, at about a mile radius, round the eastern side of the town of Lancaster to the river Lune, passing that river between the old and new bridges near to Skirton, and from thence in a straight line to the south of Torrisholme and Poulton to Morecambe Bay, at Poulton Ring. From this point the embankment should be carried across the bay to a point of land in Low Furness, which I have called Leonard's Point, lying to the north of the Gleaston river or Beck, and to the south of Newbiggin; from thence the railway will go in nearly a straight direction to the south of Dendron and Dalton to the Duddon Sands at Ronhead. The embankment across the Duddon to be taken from Ronhead Crag to Hodbarrow point in Cumberland. The length of the embankment across Morecambe Bay will be 10 miles and 51 chains, and that across the Duddon 1 mile 65 chains. The mode of making the railway embankments across Morecambe and the Duddon Sands, I propose should be as follows :—

I commence, on each side of the bay, by driving four rows of piles, the width of the railway, 21 feet apart from centre to centre, across the bay, with longitudinal timbers on the top; these timbers to be strengthened by diagonal struts or braces from the piles to the under side of the timbers, the piles to be well secured together by cross braces at the upper ends. The piles are to be driven through the sand into the clay a sufficient depth to render them quite safe. This is done by machinery constructed for the purpose, fixed upon a platform about 60 feet long, mounted upon wheels, which will move forward with the work. On the platform is fixed a carpenters' shop, to protect the men, and enable the work to go on in all weathers. The rails are laid on the longitudinal timbers as the work proceeds. On the sea side of the piles, close to the first row, I drive sheet piling, grooved into each other as high as the present line of the sand, to about two feet into the clay. This is to prevent the water making its way through the loose sand, and undermining the foundations. I have proved, from borings in various places across the bays, that the substrata under the loose sand is clay. The levels of the upper surface, and the substrata of clay, will be better seen from the section accompanying this report.

While this is going on, the coffer-dams, tide-gates, and bridges, will also be in progress, so that the whole may be completed at the same time. The level of the railway will be 6 feet above the highest, or 30 feet spring tide.

I then commence making the embankments, by running carriages, loaded with materials, on the railway, and dropping stones therefrom between the piles, to fill up the hollows, so as to make a level line or dam across the bays; the bottom of the carriages will be made to open, so that the whole line may be filled in at the same time. As the filling up proceeds, and the embankments gradually rise, the action of the sea will assist in forming a beach with a natural inclination. The waves, when propelled forward in a body by the winds, tides, and currents, possess the power to move the rolling mass of sand and other substances with them in their course, until they meet with some obstruction or point of rest. After striking the beach or embankment in an upward direction, they break and lose their force, and, in receding over a gently inclined and equal surface, they are incapable, in an exhausted state, of returning the sand or substances back to the level from whence they had forced them. Taking advantage of what nature herself points out, is the best mode by which artificial sea embankments may be formed. A great part of the materials for the embankments will thus be brought in by the waves, tides, and currents, and a natural sea-beach will be forming until the works are completed to high water-mark; after which rubble, earth, binding gravel, and small stones, will be filled in from the top of the railway. I propose to cover the seaside of the embankments with binding gravel, to the thickness of about two feet, and upon the top of that three or four feet of small stones, making a slope of about seven to one on the sea side, and two to one on the land side, of the embankments.

In regard to the time which will be occupied in completing the contemplated works, I am of opinion, that within two years from the work being fairly commenced in Morecambe Bay, the piling, framework, bridges, and tide gates, can be completely finished, and the communication effectually and safely opened across the bay. The same works would be completed in much less time across the Duddon. And the embankments can be completed in eighteen months more; making, altogether, a period of three years and a half from the commencement.

The embankment in Morecambe Bay—exclusive of the spans allotted for bridges—I calculate will require, altogether, 10,453,785 tons of material. Of this quantity, 6,149,379 tons will be brought in by the sea and furnished in the bay during the progress of the works, in the manner described above. The remainder, viz, 4,304,406, will consist of small stones, binding gravel, and other material, and will be furnished from the cutting in Furness and on the Poulton shore. I do not propose to interfere with the present channels of the rivers inside the proposed embankment, until the sea beach is completed. On the outside of the embankment it will be necessary to keep the channels open, and which I should do by working a drudging-engine. This will, at the same time, assist in forming the bank.

As the embankments rise, the tide-gates will be arranged so as to regulate the quantity of water inside the bays. When the tide ebbs to the level of the embankments, the water is then regulated by the sluices to prevent its running over the embankments, and disturbing the sand and other substances brought in by the sea. A portion of the tidal waters being for the time kept inside of the embankments, will allow the silt and mud to deposit, and thereby tend to raise and improve the quality of the land to be reclaimed. On the ebb of the tide the water from the land and rivers being let out through the sluices, and conducted near the shore, navigable channels will thus be formed under the protection of the land, and by carrying down sand and silt will aid the action of the returning tides in forming and strengthening the sea beach at the base of the embankments. By working drudging-engines along the lines of the desired new channel, their courses will soon be formed. In most parts the material found and taken out of the new channels, will be sufficient to form the banks, but in some parts facine work will be necessary. These banks will be of sufficient height to protect the adjoining lands from the highest spring-tides. The navigation to the ports inside of the embankments will not be interrupted, as vessels may pass through the tide-gates and bridges at stated and proper intervals, and when the embankments are completed the vessels will pass along the new channels. On the north-west side of Morecambe Bay I propose to direct the new channel for the waters from the Leven and Crake rivers into a basin close to the entrance of the Ulverstone Canal, which will be so constructed as to scour and keep itself clear of mud and sand, and will materially improve the port of Ulverstone, as ships may then lay close to the shore. Over this channel a draw-bridge will be made, and after the embankment is completed the tide will be allowed to flow up and down, so that whenever there is a sufficient tide in the river ships will be able to pass up to Ulverstone with much more certainty and security than at present.

At the entrance I also propose to place pointed gates, which, in the event of an extraordinary high tide, can be shut, and thus the land inside protected from the damage consequent upon such high tide.

On the east side of Morecambe Bay, I propose to have tide-gates to allow the passage of small vessels into the new channels to be made for the waters from the Kent and Wynster rivers. From the best inquiries I could make I have not found the traffic up these rivers of sufficient magnitude to require a draw-bridge.

During the progress of the embankments, or when raised to near high-water mark, and before the tides can be altogether shut out, no fears need be entertained by proprietors of land round the bay, that they will be more inconvenienced than they at present are at high tides—as the water inside of the embankment may be gradually lowered through the sluices, on the decrease of the tides from spring to fall. A parapet bank or wall of earth will be raised about six feet above the level of the railway, on the side of the embankments next the sea, to protect them from the wind and spray.

This report is accompanied by plans, sections, and models, which will better explain the position of the proposed embankments across the two bays, the line of railway from Lancaster to Morecambe Bay, and across the peninsula of Low Furness, and the branch railway to Ulverstone, as well as the intended new channels, tide-gates, &c., and the mode by which the operations are intended to be carried into effect.

As regards the expenses of these various works, I estimate that the timber, iron, materials, and workmanship, for the piles, frame-work, railway, and embankment, tide-gates, drawbridge, &c., on Morecambe Bay, will amount to 289,359*l.* 14s. 10d.; and the expenses of forming the new channels on each side of this bay, to 73,501*l.* 6s.—making the expenses for Morecambe Bay 362,861*l.* 0s. 10d., or about 34,111*l.* 10s. per mile, calculating the distance at 10 miles 51 chains. The same works on the Duddon will amount to 55,870*l.* 8s. 6d., and the new channels to 15,400*l.*—making the expenses for the Duddon 71,270*l.* 8s. 6d., or about 39,322*l.* per mile, calculating the distance at 1 mile 65 chains. The total expenses for the embankments, &c. of the two bays, will thus be 434,131*l.* 9s. 4d. The reason why the Duddon is more expensive is, that the cost of the erections on each side are as great as on Morecambe Bay, whilst the distance is so much less.

The quantity of land which will be reclaimed by means of these embankments and works, I estimate at about 52,000 acres—namely, about 46,300 acres in Morecambe Bay, and 5,700 acres in the Duddon; and taking the land at 23*l.* per acre, on an average, the total value of the land to be reclaimed will be 1,196,000*l.*

The remaining part of the line will pass through a district of country peculiarly favourable, and presenting no obstacles of importance. As, however, this is now being surveyed by Mr. Rastrick, I forbear making further comments. I am, however, justified in stating that, although the cost of the two embankments will be considerable, I am well satisfied, that the total average cost of the whole line from Lancaster to Maryport will be much under that of most of the existing railways.

A railway is, or will shortly be, opened to Preston; and, in the course of the ensuing year, one will be opened to Lancaster; and with the Caledonian, West Cumberland, and Furness Railway carried into effect, the communication will be complete from London to Carlisle, a distance of 301 miles: and, in such case, there can be little doubt but a line will be continued from Carlisle to Glasgow, thus forming a chain of railway communication from London through the great agricultural, commercial, mining, and manufacturing districts of Scotland, alike profitable and beneficial to both countries, and which will also greatly facilitate the communication with the north of Ireland. The en-

closure of Morecambe Bay and the Duddon Sands, and the reclaiming of so great an extent of land, at present overflowed and unproductive, may be considered of itself an object of national importance; and, no doubt, will be favourably looked upon and supported by the Government.

Being only required, by my instructions, to report as to the practicability of forming embankments across the two bays, and the diversion of the rivers, I do not feel called upon to enter into a comparison of the advantages which this line of railway will possess over the other projected lines through the mountainous districts of Westmorland, or of the eastern line through Yorkshire, Durham, and Northumberland; or to enlarge upon the benefits calculated to arise to the public generally, or to the local interests in particular. I will merely observe, that the "Caledonian, West Cumberland, and Furness Railway," if carried into effect, must be greatly advantageous to the existing railways from London to Lancaster, and Maryport to Carlisle—promote the commerce and industry, and improve the value of property, in the districts through which it passes—and cannot be otherwise than ultimately profitable to the shareholders who may engage in the undertaking.

I have the honour to remain, Gentlemen,
Your obedient servant,
36, Cable-street, Wellclose-square, London. JOHN HAGUE.

ON LIMESTONE AND CALCAREOUS CEMENTS.

BY ARTHUR AIKIN, ESQ.

(*From the Transactions of the Society of Arts.*)

When men began to assemble themselves in society, and to occupy fixed habitations, the first great work on which to employ their common exertions would be, surrounding the space covered by their huts by a mound or wall, in order to keep out wild beasts and their still more dangerous human enemies. With this view, the most favourable situation that could be chosen would be a detached rocky hill, of moderate height, flat-topped, and having its flanks more or less protected by inaccessible precipices. On the more gently sloping sides a wall would be raised by collecting the largest blocks lying about, and laying them on one another; at the same time so adapting their irregular surfaces as to leave between them the least possible spaces, and filling up these spaces with smaller pieces of stone. Walls of this kind, if skilfully built, and with blocks of large dimensions, even if not united into one mass by the use of cement, oppose, by the mere magnitude and weight of their ingredients, great impediments to disintegration, either from natural causes or external violence. If the hill thus occupied were massive in its structure, like granite or basalt, the blocks furnished by it would be of very indeterminate figures, and the face of the wall would present the appearance of irregular polygons, which would require, on the part of the builders, considerable skill to arrange without insterstices. But, if the hill were composed of beds or strata, lying over one another, then the blocks would offer at least two parrallel faces, and thus would be far more easy to arrange as a wall. Examples of this very antique mode of building, generally known by the name of Cyclopean, are by no means unfrequent in Greece and in Italy, especially in that part of it formerly called Etruria. Mycene, in Peloponnesus, is very remarkable for its gateway and walls of Cyclopean architecture, which we know to have resisted the utmost efforts of the Argians to demolish, at the time they took the city, and have since, for a long series of centuries, continued to brave the destructive rage of barbarians and of the elements. Even in more regular and elaborate structures of hewn stone, where the blocks are large, and the surfaces of pressure well levelled, the use of cement may be dispensed with, as is the case in the antique temples of Upper Egypt.

But where, from choice or necessity, the materials of building are pieces of small size, whether regular or irregular in figure, it is impossible to make of them solid and durable constructions without the use of cement of some kind interposed between the pieces, in order to bind them together. Every one who has travelled through the hilly districts of this country, must have observed the dry stone walls by which the fields are enclosed, and probably have personally experienced the ease with which a breach may be made, even in those that are the most carefully and solidly built. We know, from the concurrence of sacred and profane history, that one of the earliest seats of the human race was the alluvial plain watered and periodically inundated by the Euphrates. In this district neither rocky strata nor detached blocks of stone are to be found, but a tenacious and silty soil offers to the ingenuity of man materials capable of being moulded into artificial stone, that is, bricks, of any desirable form. It is impossible to make bricks of very large dimensions, as the clay would infallibly crack in drying, as well as in baking. While, therefore, we learn from historical authority that the structures of ancient Babylon were raised in brick, we know, from the testimony of modern travellers, who have examined the ruins, that these bricks are not more than about 13 inches square by about three inches thick. From this fact we might infallibly conclude, even in the absence of all direct evidence, that cement of some sort must have been employed in raising walls and other solid buildings of such materials. Bitumen, in a melted state, was, as we are informed by Herodotus, and by the author of the book of Genesis, the substance made use of on this occasion; and this statement is confirmed by recent observers, who not only inform us that at Hit, a district a little higher up the river than the ruins of Babylon, there are even now numerous springs of petrolium; but that what seem to be the oldest parts of the ruins themselves, are constructed of layers of unburnt brick, faced by layers of burnt ones; the whole cemented together by bitumen and mats made of reeds. But the knowledge and use of calcareous cements was either contemporary with that of bitumen, or was invented shortly after; for among these very ruins occur many parts built of burnt brick set in lime-mortar, which latter, even at the present day, is of extreme toughness and hardness.

But no ancient people seem to have made so much use of calcareous cements as the Romans, for, with the exception of the cloaca maxima, or great sewer—a prodigious subterranean vaulted tunnel, constructed, in the reign of their king Tarquinius Superbus, of blocks of a light and porous stone, without any cement whatever—with the exception, I say, of this great work, all the other public structures appear to have been of brick or stone, cemented by lime mortar. Nor was it in raising buildings alone, in the usual acceptation of the term, that calcareous cements were employed by the Romans; the chief of their military roads and highways were pavements resting on a foundation of rough stones consolidated into one mass by liquid mortar or grout, which, beginning at Rome itself, accompanied and facilitated the march of her conquering legions to the very remotest extremities of the empire. The port of Ostia, at the mouth of the Tiber, was a place of immense consequence, as commanding the whole water communication of the capital with the provinces, and great exertions were made, by the construction of moles and jetties, to convert the naturally hazardous and exposed entrance of the river into a secure and capacious harbour. The fashion, also, among the more opulent classes, of quitting Rome during the heats of summer, for a residence in the numerous villas on the shores of the bays of Naples and Baiæ, and which were frequently constructed on moles actually projecting into the sea, rendered necessary the invention of a cement capable of preserving its efficacy even under water. Accident or experiment, discovered near the town of Puteoli (itself situated on the bay of Baiæ) a bed of porous, half-concreted matter, which, when reduced to powder and mixed with lime, or with common mortar, gave to it the property of hardening under water. The substance described by Vitruvius and by Pliny, by the name of powder of Puteoli (Pulvis Puteolanus), still retains essentially the same appellation; only, as the name of the town has been modernized into Pozzuoli, so that of the substance has passed into that of puzzolana.

If the description given by Julius Cæsar of the towns in the south-eastern part of Britain, which, from its vicinity to the continent of Europe was also the most civilized, be at all correct, it is highly probable that the use of calcareous cements was not known in this country till after its conquest by the Romans. Of the buildings erected by them the greater part have now perished from the effects of time and of violence; but some of the simpler kinds still remain sufficiently entire to show their style of building, and the durability of their materials. The most ancient limestone quarries in the kingdom, and which continue still in full activity, having been originally opened by the Romans, are at Tadcaster, in Yorkshire, the name of which place in the Roman itineraries is, from this circumstance, called Calcariæ.

The essential ingredient of all calcareous cements is lime, a substance which never occurs naturally in a pure state, being always combined with some other body, as well as mechanically mixed with impurities of various kinds. The usual state in which it is found is as an earthy salt, called, when crystallized, calcareous spar; and, when massive, limestone, being combined with carbonic acid in the proportion of about 54 of lime to 46 of carbonic acid in the 100 parts.

The natural state of carbonic acid, under the ordinary atmospheric pressure and temperature, is a gas, or permanently elastic fluid; and as this gas is but sparingly soluble in water, it follows that when we put a piece of limestone in a glass, and cover it with water, and then add any substance capable, by combining with the lime, of separating the carbonic acid, this latter will rise through the water in a stream of bubbles, producing that appearance which the chemist calls effervescence. Most acids, when dissolved in water, will separate carbonic acid from lime in the way I have just described; and hence we are furnished with an easy test for distinguishing limestone from sandstone, and from other usually occurring rocks, by its almost entire solubility, accompanied by effervescence, in cold dilute muriatic, or nitric acid; the proportion that remains undissolved indicating with considerable, though not perfect, accuracy, the amount of impurities.

Every kind of limestone is not equally adapted to the use of the bricklayer; and, as these differences depend partly on mechanical and partly on chemical properties, it becomes necessary to describe somewhat in detail the principal varieties of limestone, as far as their economical use is thereby affected. With this view they may conveniently be arranged into four families.

The first includes those limestones which are, for the most part, of a pale colour, and burn to a white lime, containing very little foreign matter.

Of these, the purest is white granular or statuary marble, which contains hardly any impurities, except a little silicious earth. This is actually used by the chemist, when he wants a lime purer than usual; but as, when heated it is very liable, on account of its granular crystalline structure, to fall into a coarse powder, it is manifestly incapable of being burnt in a common limekiln, and therefore is of no use as a material for mortar.

White chalk is another of this family, which, on account of its softness and porousness, is easily quarried, and requires less fuel and a shorter time for its burning than common gray limestone does. It has, however, this disadvantage, namely, that the cores or centres of those pieces that have been only superficially burnt, are easily broken down with the back of a spade, and therefore are often mixed up with the other ingredients of the mortar, instead of being scrupulously rejected, as they ought to be.

Oolite is another limestone of this family, and derives its name from the small round grains or concretions of which it is principally composed, and which were formerly supposed to be the eggs of fish in a petrified state. In

hardness, and other qualities, it holds a place intermediate between chalk and gray limestone.

Gray limestone, itself, includes all those beds in mountain limestone and in transition limestone which, with a structure passing from scaly into compact, are decidedly harder than the preceding, and require the assistance of gunpowder to detach them from the quarry, unless where they occur in very thin beds. They take, in burning, a longer time and somewhat greater quantity of fuel than the preceding, and are often mere aggregates of corals and other organic remains. The amount of impurity, chiefly sand and clay, rarely exceeds four or five per cent., and the darker varieties usually furnish the whitest lime, showing the colour to be chiefly carbonaceous.

The second family includes the swinestones and bituminous limestones; the first name being given to them from the fetid smell, like that of a pig-sty, produced by rubbing them against any hard substance. Their colour is dark brown, passing into black; all the varieties of black marble being of this kind. When heated red-hot, the carbonaceous colouring matter begins to re-act on the carbonic acid, converts it into another gas called carbonic oxide, which, having no attraction for lime, flies off, leaving behind the lime itself, of a snow-white colour, and rendered perfectly caustic, in a shorter time, and by a less expenditure of fuel, than is required for any other kind of limestone. Being, when burnt, more porous than any other of the compact limestones, it falls down into an exceedingly fine powder, by the action of water, or on exposure to the air; a quality which renders it particularly valuable to the farmer, as well as to the builder.

The third family is that of the magnesian limestone. Its chief repository in this country is that very extensive formation called the new red sandstone, which, in the natural series, lies immediately above the coal measures: here it occurs in thick beds, as well as occasionally in the mountain limestone. Its colour is sometimes reddish, but usually is of a pale yellowish brown. Many varieties have so greatly the aspect of fine grained sandstone, that they were for a long time considered as such; but a minute inspection will show that they are an aggregate of small rhomboidal crystals, which on analysis prove to be compounds of carbonate of lime and carbonate of magnesia, the relative proportions of which, though subject to considerable variation, may be stated at about three-fifths carbonate of lime, and two-fifths carbonate of magnesia. If a piece of this limestone be put into cold dilute nitric acid, it will dissolve very slowly, with hardly any sensible effervescence, although in hot acid the effervescence will be as vigorous as with common limestone. When burnt to lime, it retains its causticity for a much longer period than common lime does; and, therefore, no doubt modifies to a certain degree the properties of the mortar into the composition of which it enters, although its precise action has hitherto been very little investigated.

The fourth and last family includes those limestones which contain in their composition so large a proportion of iron and clay as to enable them to form cements, which have the property of becoming solid under water, and, therefore, are peculiarly valuable in subaqueous constructions.

One of these is the gray chalk, or chalk-marl. The bottom bed of the great deposit of chalk is considerably thicker than the upper ones, and contains no flints; in colour it is of a less pure white or gray, and is considerably harder than the upper chalk, so that many parts of it make a tolerably good building stone. In composition it is not uniform; the proportion of slightly ferruginous clay that it contains, notably increasing from the top to the bottom of the bed: the lower parts moulder by exposure to weather; and the lowest of all not only moulder, but are more or less slaty in structure; that is, are in the state of true marl. That part of the gray chalk which is used for water cement, contains various proportions of clay, from six or eight, up to about 25 per cent., and after burning has a pale brownish yellow colour. It is known in the London market by the name of Dorking lime, there being very extensive quarries of it near that town, as well as at Merstham and Halling.

Another and still more valuable variety of limestone for water cement. is the blue limestone, which is generally of a dark dove colour, and of a dull earthy aspect: by long exposure to weather it becomes, superficially at least, of a liver brown, and when burnt into lime is of a buff colour. It forms occasional beds in the transition and mountain limestone deposits, but constitutes nearly the whole of the lias limestone. This latter is one of the most remarkable of the English strata. Its geological position is between the lower oolite, and the new red sandstone. It passes obliquely through the country in a direction from N.E. to S.W.; from the sea coast at Whitby, to the cliffs at Lyme-Regis in Dorsetshire, on the British Channel. In its course southward it passes to the east of York, and crosses the Humber near the junction of the Trent and Ouse; thence it passes through the western edge of Lincolnshire, and traverses the counties of Nottingham, Leicester, Warwick, and Gloucester; its breadth in this part of its course being pretty uniformly about six miles. Hence the main body proceeds in nearly a southerly direction through Somersetshire to the coast of Dorset, while a broken line of the same skirts along the southern shore of the Bristol Channel as far as Watchet, and appears on the northern shore in detached patches in the counties of Monmouth and Glamorgan. The entire thickness of this deposit is perhaps about 250 feet; the middle part consists of beds of blue limestone alternating with blackish slaty marl; the upper and lower parts, being less calcareous than the middle, are composed chiefly of beds of marl, in which are harder masses of a compressed globular figure, less clayey than the slaty marl in which they are found, but less calcareous than the blue limestone. The quarries of Watchet, Aberthaw, and Barrow, in Leicestershire, were long celebrated for the excellent water lime which they produce, before it had been ascertained from geological surveys that they are only on different parts of the same deposit. From an analysis by Mr. Smeaton of the blue limestone of Watchet, Aberthaw, and Bath, the proportion of iron and clay in each appears to be the same, or about 11½ per cent. The blue lime of Barrow, according to Mr. Marshall, contains about 14, and according to Smeaton, 21·3 per cent. of the same ingredient, and that of Westbury, 9 per cent. The lias limestone used by the London builders, is brought from Lyme-Regis, but is little used in the metropolis, being about 25 per cent. dearer than Dorking lime, the difference in cost depending, in part at least, on the longer time and greater quantity of fuel required in burning it.

The balls which I have mentioned as occurring in the upper and lower beds of the lias formation, are not peculiar to it, but appear to be formed in all deposits of bluish slaty clay that contain carbonate of lime, but not sufficient to separate from the rest of the ingredients into distinct beds of limestone. Thus, in several of the beds of blue clay that lie above the chalk in that district called the London Basin are to be found layers of compressed spheroidal balls, known by the name of septaria, or cement stone. The outer part of them consists of obscurely slaty concentric layers, with an excess of clay, and which peel off by long exposure to the air; the interior part is more compact, and is not unfrequently divided into nearly cubical pieces by cracks generally filled or lined with calcareous spar. They may be observed in the cliffs of London clay that form the eastern coast of the island of Sheppy, also in the low cliff at Southend, at the mouth of the Thames; and they have been dug up wherever excavations have been made in the London clay, as at the archway road at Highgate, and in the deep cutting and tunnelling now going on for the London and Birmingham railway, near Primrose-hill. Of late years these stones, burnt and reduced to powder, have been very extensively used in all water building and other masonry requiring particular care, with such success as to have entirely superseded the employment of puzzolana, and of Dutch tarras. With this concludes my survey of the calcareous raw materials employed in the construction of cements, in which I have begun from the purest kinds of limestone, and have terminated with those which contain the smallest proportions of carbonate of lime.

Two other sorts of materials now require a short notice. The first comprehends a few non-calcareous substances, the essential ingredients of which appear to be oxid of iron and burnt clay, which have the power of giving to mortar made of white lime the property of becoming extraordinarily hard, and of setting under water.

Of these, puzzolana is volcanic ashes, thrown out of Vesuvius during its eruptions, and concreted, on the places where it has fallen, into a cellular mass of a rusty colour, and of slight cohesion.

Tarras, or trass, is a bluish black cellular trap or lava, quarried at Andernach on the Rhine into mill-stones; the fragments produced in making which are sent to Holland, where they are ground into powder: and when mixed with lias lime form a cement, extensively used in the dykes and other water buildings of that country.

In England, Rowley rag, a basalt obtained from the Rowley Hills in Warwickshire, and in composition probably very similar to the Andernach stone, has been used for the same purposes with good effect.

The other non-calcareous ingredient employed in the composition of mortar is sand, which, with reference to this use of it, may be divided into the pure and the clayey, the coarse and fine-grained, the round and the sharp-angled. Smeaton has shown by actual experiment, that raw clay sensibly impairs the hardness of mortar; it is obvious, therefore, that the use of pit-sand, which is generally dirty, should be avoided where it is possible, unless it has been previously cleaned by washing till it no longer troubles the clearness of the water. As the action of sand in mortar seems to be merely mechanical, that which is sharp-angled is evidently better than that which is round, as offering a better surface for the adhesion of the lime; it is likewise manifest that a due admixture of coarse and fine sand will fill a space, leaving the smallest interstices, and, therefore, capable of greater resistance to external pressure. Where chalybeate springs rise out of sand, the colour of this latter is yellow, from the intermixture of ochre; and such sands, if free from clay, produce a cement of extraordinary hardness.

Limestone, even when reduced to the finest powder, is wholly inefficacious in the composition of mortar, and it is only useful for this purpose when the carbonic acid has been driven off from it by a high heat continued a sufficient length of time. The fetid limestones, as I have already mentioned, may be wholly deprived of their carbonic acid at a lower heat than is required for the other limestones. In these latter it is probable that no difference in intensity of heat is required, but a longer continuance of it, according as the limestone under operation is more or less clayey, and more or less compact. The separation of the carbonic acid begins from the outside of the pieces, and so proceeds to the centre. The size, therefore, of the pieces before burning should be as small as is consistent with the expense of breaking them. It may easily be judged whether a kiln of limestone has been perfectly burnt by taking a few samples, and selecting a piece as big as a pea from the middle of each, and then dropping them separately into a glass containing weak muriatic acid. If no effervescence ensues, the burning has been complete, and the degree of its incompleteness may be estimated by the vigour of the effervescence as compared with that of an equal piece of the same limestone unburnt.

As soon as the lime has grown cold, it begins to reabsorb carbonic acid; and, in course of time, will fall to pieces, and return to the state of carbonate; there is, therefore, an obvious advantage in using lime as soon as possible after it has been burnt; there is, however, a considerable difference in the rate at which different limes recover their carbonic acid; the white limes take it up the most rapidly, and the argillaceous and magnesian ones the most slowly. In an experiment by Mr. Marshall, a piece of white Bristol lime

kept in a drawer, was found, in seven days, to have increased in weight 33 per cent.; while a piece of blue lias from Westbury, in the same time, and in the same place, had increased no more than 10½ per cent. In close casks, the lias lime will keep good for a long time. Smeaton's experience goes as far as seven years; but, in this case, the lime was previously reduced to powder by slacking with water, and then was trodden hard down into the casks.

When cold water is poured on a piece of perfectly well-burnt lime, it is rapidly absorbed, and in great abundance; the piece becomes warm, then cracks, gets hotter than the hand can bear, exhales a large quantity of steam, and finally falls down into a dry powder, almost as fine and impalpable as flour. To appearance, the whole of the water is evaporated; but the great heat produced, shows that very energetic chemical action has taken place; and, on weighing the lime, it will be found to have increased in weight 24·2 per cent., which increase is nothing but water combined with the lime into a solid substance, and which no heat short of redness will separate from it. This compound is called hydrate of lime, or slacked lime; and it is this, and not lime itself, which enters into the composition of mortar. Lime will not combine with water if it retains its carbonic acid; and, therefore, those pieces that are very imperfectly burnt, remain as lumps or cores after the rest has fallen to powder; and if these lumps are too hard to be broken by a blow of a spade, the mortar is all the better for their exclusion.

By the addition of a little water, hydrate of lime may be made into a stiff paste, which, in a short time, will become dry, and will retain its form, although it possesses scarcely any hardness or tenacity, and a shower of rain will wash it all away. It is only by the admixture of sand and other hard substances that it acquires the properties of a mortar or cement. The proportion of sand that can be incorporated into mortar, depends partly on the fineness or coarseness of the sand itself, and partly on the nature of the lime; but, as the sand is the cheaper ingredient, there is always a temptation to excess on this side. Pliny mentions that the failure of buildings at Rome in his time was owing to a deficiency of lime in the mortar; the proportions being 1 of lime to 4 of sharp pit-sand, and 1 of lime to 3 of round-grained sand from the sea or river: he likewise adds, that the quality of the mortar is greatly improved by the addition of a third part of pounded tiles. The common London mortar is made of 1 part white chalk lime, and 2½ of clean sharp river sand; but, not unfrequently, dirty pit sand is substituted for the latter, and the lime itself being very imperfectly burnt, a mixture is the result which never becomes hard, and has only a very imperfect adhesion to the bricks. White lime, when really good, will take a larger proportion of sand than the brown limes will, but, in the London practice, the reverse generally prevails; an additional proof of the badness of common chalk lime. Although it be certain that lime has a considerable chemical attraction for silica in a state of solution, or, perhaps, of very fine division, yet it seems improbable that any action should exist between the two, when the silica is in grains of sand, especially considering their hardness, and, consequently, the strong adhesion between the particles of which they are composed; yet there are certain facts and points of practice which can hardly be explained, unless this be admitted. The cohesion of a paste of hydrate of lime is not greater than that of a paste of carbonate of lime or chalk, and if the action of sand were merely mechanical, it is not easy to understand why it should form, with hydrate of lime, a strong cement, and not with chalk. It was an ancient law in Rome, that after the ingredients of mortar had been rubbed together with a little water, the mass should be kept in a covered pit for three years before being used; and we are expressly informed by Pliny, that buildings erected during the operation of that law were not liable to cracks. It was likewise an ancient practice (and Smeaton has confirmed the advantage of it by his own experience) to beat the mortar for a long time with a heavy pestle, just before being used; the effect of which would be, not only more thoroughly to mix the ingredients, but to rub off from the outside of the grains of sand the compound of lime and silica, if such had been formed, and, by incorporating it with the mass, dispose it the more rapidly to consolidate. Mr. Smeaton also found that mortar made with white lime, is far more improved by repeated beating, than cement formed of argillo-ferruginous lime, which is satisfactorily accounted for by assuming (and it may be done with great probability) that the combination of part of the lime with the clay is effected in these latter limestones during the process of burning. The same excellent observer also found that if two samples—one of well-beaten mortar, and the other of mortar mixed only in the usual way—be afterwards diluted with water to the state of grout, the former will set sooner and become harder than the latter, which is all in favour of chemical action taking place between the ingredients. This combination of lime and silica (perhaps, I ought only to say this supposed combination) appears, however, to be decomposable by the carbonic acid of the atmosphere, just as silicate of potash is; for, by long exposure, the lime in mortar will regain the greater part, but, probably, not the whole of its original carbonic acid. Thus Mr. Tennant found that common mortar, which had been exposed to the air for a year and three quarters, had regained only 63 per cent. of its full quantity of carbonic acid; and Mr. Marshall found that some mortar from Pickering Castle, some centuries old, had regained not more than 86 per cent. of its carbonic acid. I may also mention, as having some relation to this question, that many attempts have been made to burn old mortar, with the expectation of bringing it again into a state capable of forming a cement when mixed with water, but without the smallest success.

Of water cements there is a great variety, both as relates to the ingredients themselves and their composition; some of the principal of which I shall now proceed to notice. The only cement employed by the Roman builders, in the erection of moles and other structures in the sea, was 1 of lime, and 2 of puzzolana.

Mr. Smeaton's cement, which he employed in building the Eddystone Lighthouse, was equal measures of Aberthaw lime in the state of hydrate and in fine powder, and of puzzolana, also in fine powder; proportions which, if reduced to weight, and due allowance be made for 24 per cent. of water in the lime, differ not materially from those recommended by Vitruvius. The cement was also well beaten, till it had acquired its utmost degree of toughness, and, probably, therefore, till chemical action had begun to take place.

The gray chalk of Dorking forms the basis of a number of excellent cements, for use both in water and on land. The composition of that which is most generally used is 1 of lime to 3 or 3½ of sharp river sand; and for filling-in the interstices of thick walls, 1 of lime to 4 of coarse gravelly sand.

The piece of brick-work on the table is part of the boundary wall of the East India Dock, built in 1804, and taken down in 1834. It was cut off a large block, carried away on a truck, and afterwards chiselled into shape, without the cement giving way in the slightest degree. It was composed of 1 part Merstham lime, and 4 parts gravelly sand dug out of the excavation of the dock; and if this sand was, like that dug out of the London Docks, deeply coloured with yellow ochre, the extraordinary goodness of it is very satisfactorily accounted for, and it differs from two other specimens before you only in the circumstance that the former of these contains 2 of the same kind, and the other 5.

To the same class of cements belong a specimen composed of 1 lime, and 3½ of sand dredged out of the Thames, and two concretes or pebble mortars; the former of which was composed of 1 lime and 7 river ballast, and the latter of 1 lime and 8 clean-washed shingle.

Tarras mortar, made of white lime and tarras, requires long and repeated beating to bring it to perfection; probably, in consequence of the tarras not having previously been roasted. And the evidence of chemical action among the ingredients of this cement is unquestionable, by its *growing*, as the workmen call it, in the joints of the masonry, owing, no doubt, to the expansion of the tarras, in proportion as it is acted on by the lime.

In the cements made with lias, or argillo-ferruginous limestone, the clay and oxide of iron seem to have combined with the lime during the burning, forming a compound capable of uniting with great firmness, and without much difficulty, with an additional portion of sand, or of burnt ferruginous clay; the quantity of this latter admissible into the cement being probably the less, as the amount of the same in the lime itself is the greater. Lias is but little used in London, on account of the greater cheapness of yellow chalk, which answers nearly the same purpose, but is not so strong. It was, however, employed in the cement used for setting the bricks that form the facing of the London Docks, to the depth of 14 or 18 inches from the outside. The precise composition of the cement was—

4 lias lime,
6 river sand,
1 puzzolana,
1 calcined iron stone,
—
12.

The celebrated ash-mortar, or *cendrée* of Tournay, may be mentioned as perhaps, the best of the lias cements. It is thus prepared. After the large pieces of lias are withdrawn from the kiln, there remain a quantity of small fragments, mixed with the ashes, of the very slaty coal, which is the fuel employed, in the average proportion of 3 of ashes and 1 of lime. Of this mixture, about a bushel at a time is taken, and is sprinked with water only sufficient to slack the lime; the whole quantity, thus treated, is then put into a pit and covered with earth, where it remains for some weeks. It is then taken out, and well beaten by an iron pestle for half an hour, which brings it to the consistence of soft mortar; it is then laid in the shade for a day or two dry, and again beaten till it becomes soft. This is repeated three or four times, till at length it is only just sufficiently soft for use; being then applied to brick or stone, it forms, in a few minutes, a very compact mass, and, after twenty-four hours, has acquired a stony hardness.

The process and its effects are well worthy of notice. The coal-ash is chiefly burnt clay, in a state of fine division, and, therefore, well fitted to combine rapidly with the argillo-ferruginous lime. By bringing the lime to the state of hydrate, and allowing it to remain for some time in contact with the ash, a commencement of combination in all probability takes place; this is carried farther by the process of beating, during which the lime parts with its water, and combines with the ash; and when, by a continuance of this process, no increase of moisture is produced, it may be presumed that nearly perfect combination of the lime and ash has happened, and the cement is then ready to set and become solid.

I have already explained what the balls are of which Roman cement is formed, namely, a limestone more highly charged with ferruginous clay than even lias limestone; so that they may, without impropriety, be considered as containing not only the calcareous ingredient, but the ferruginous clay also required for the composition of cement. On this account it is that, when burnt, so little of their lime is in a state to become hydrate, that, though when moistened with water the mass will heat, it will not fall to powder, but requires to be ground, and, when afterwards beaten, it will form a hard cement without any further addition. It is, however, capable of combining into a firm mortar, with a considerable proportion of sand, either alone or mixed with yellow chalk lime, which considerably reduces the cost,

and, at the same time, produces an excellent cement, either for land or water building. The cement stones are prepared for use by making a judicious selection of them, breaking them into pieces about two inches cube, stratifying them with coal in a kiln, and burning them for several hours. One bushel of coals, with careful management, will roast eight bushels of cement. The kiln is kept in constant activity, and the roasted stones are taken out immediately from the kiln to a mill, where they are ground to powder. This powder is then, without delay, to be packed in tight casks, as exposure to the air much weakens it, although it may be kept for many months in an open place, without becoming quite effete. The best cement powder, when mixed and prepared for use, has a dusky green colour, and I am informed that some of the manufacturers are in the habit of mixing the burnt stone, before grinding, with certain proportions of copper slag, a substance consisting chiefly of sulphuret of iron and oxide of iron, and, therefore, an exceedingly valuable addition, if not too liberally employed. The two bricks on the table have been cemented with a compound of 1 yellow lime, 2½ of pulverised copper slag; and I observe, on the surface of the cement, a saline efflorescence, which, in stucco and other dry work, might prove detrimental.

Oxyde of iron in almost any state, but especially when not fully oxydized, such as smiths' scales, roasted iron ore, &c., is also a very useful ingredient, giving firmness and the property of setting under water to mortars made of white lime, and adding to the peculiar characteristic excellences of those made with brown or yellow lime.

The general theory that seems to me to explain with fewest difficulties the nature of calcareous cements is the following:—

In the white limes, or nearly pure carbonates of lime, the only effect of burning them is to drive off the carbonic acid. By slacking, the lime becomes a hydrate, and, in this state, is capable of acting chemically, though feebly, on the surface of pure siliceous sand. This combination causes the first setting of the mortar, which is also strengthened by the mere mechanical action of the sand. The greater part, however, of the lime has not combined with the sand, but remains in the state of hydrate; in proportion as it absorbs carbonic acid from the air, it gives out its water and passes to the state of carbonate: such mortar, therefore, acquires its final induration and dryness when the whole of the hydrate has been decomposed, and the water replaced by carbonic acid. In losing 22 per cent. of water, it combines with 46 per cent. of carbonic acid, and, therefore, the mortar becomes the more solid and strong.

In the blue limes, part of the calcareous matter combines, during the burning, with the intimately mixed ferruginous clay, forming a compound that gives to the cement made of it the property of setting speedily in the air or under water. The rest of the lime passes, by slacking, into the state of hydrate; and, if only siliceous sand is present, acts on it in the same manner as white lime does; but if ferruginous sand, or burnt ferruginous clay be present, the hydrate acts more rapidly and powerfully on the clay, sooner gives out its water, and consolidates: whether this latter compound is afterwards decomposable, by exposure to the carbonic acid of the air, I do not presume to determine.

In those limes that contain naturally so much ferruginous clay as, after burning, to form cements without the addition of sand or other ingredient, the greater part of the lime is probably combined with the clay in the act of burning, a very small quantity of hydrate will be formed, and very little carbonic acid will be reabsorbed.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

At a meeting of the Royal Society on Thursday, the 22nd of November, the chairman, Mr. F. Baily, put in nomination the Marquis of Northampton, as president. As, in conformity to the by-laws, no other Fellow was proposed for that office, the election of his lordship took place at the anniversary on St. Andrew's Day.

ROYAL ACADEMY.

On Monday, Nov. 5, a general assembly of the Academicians was held in Trafalgar-square, when Mr. W. C. Ross, Mr. D. Roberts, and Mr. R. Westmacott, were elected associates.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The council contemplate the formation of a students' class, composed of young men studying as architects, and under 21 years of age. It is proposed that the rooms should be open to them two evenings in the week, and that one of the Fellows should attend, under whose superintendence they should sketch subjects. They are to pay one guinea per annum, and to have access to the books and collection, and the *entrée* to the lectures and ordinary meetings. Prizes, also, will be awarded to those who most distinguish themselves by their attendance and studies.

ARCHITECTURAL SOCIETY.

The Society commenced the session for 1838-39 with a conversazione, which was held at the Society's Rooms, 35, Lincoln's Inn-fields, on Tuesday evening, 6th November. William Tite, Esq., F.R.S., F.G.S., President, in the chair.

The secretary read the report from the committee, which commenced by stating that, notwithstanding the very difficult and extraordinary position in which the society had been placed, the present session opened under happier auspices, and with brighter prospects than, perhaps, it ever had the good fortune to do. It referred to the occasion on which their late president (Mr. Clarke) took leave of the members, prior to his departure to the continent, where he was about to travel and remain for some years. He expressed himself as still most anxious to promote the interests of the society during his absence, by obtaining the attention of foreign architects, and of his promise to transmit, from time to time, whatever information appeared to him valuable, and likely to prove acceptable to the society and that he should still continue to be one of its most attached members. The report alluded to the laudable exertions made by the student members in the competition of the session, and mentioned the names of Messrs. Morgan, Rutherford, Nunn, and Williams, as having received the prizes in the departments of measured drawing, original sketches, and essay composition.

The subjects for competition for the present session were announced as follows:—*In the Class of Design*—subject, Marine Baths; to be an isolated building, with principal front facing the sea. *In the Class of Drawing*—the principal front of St. Mark's Chapel, North Audley-street; and *in the Class of Essay Composition*—the treatment of the Ionic order in the various buildings of the ancients. The prizes to be awarded—

In the Class of Design, to be a pair of Silver Compasses.

In the Class of Drawing, to be Sir W. Chambers' Civil Architecture.

In the Class of Essay Composition, to be Hope's Architecture.

The report enumerated the donations to the library and museum, and also to the funds of the society. To the latter, W. Tite, Esq., subscribed 30 guineas; and Mr. G. Smith, one of the vice-presidents, 20 guineas.

The president delivered a very suitable and appropriate address, which reverted to the resignation from the chair of the late president, and his own election; the grounds upon which he accepted the office, and his reasons of so doing. He then recommended a course of study requisite for the architectural student; and, by way of strengthening his own opinion, gave some extracts from Vitruvius: he also stated his intention to advance the interests of the society to the best of his ability, and announced his intention to read papers occasionally during the session.

The president then called the attention of the meeting to Mr. Whishaw's hydraulic telegraph, and to some highly finished specimens of locks and other fastenings, which had been forwarded as patterns of workmanship by Messrs. C. Smith and Son of Birmingham. There were also exhibited several other works and drawings; some of the portfolios were very interesting, and attracted considerable notice; so did a very highly finished and beautiful model of the Epi scopal chapel now erecting in the cemetery ground at Norwood.

The meeting was very fully attended; and from the lateness of the hour at which the company separated, it may fairly be supposed that they were well satisfied with the business of the evening.

INSTITUTION OF CIVIL ENGINEERS.

In our last number, page 383, column 2, we gave the substance of a communication from Mr. Buck read before the Institution, in which there is an error. For the word "*unanimous*" read "*maximum*."

SOCIETY OF ARTS.

At the ordinary meeting held on Wednesday evening, November 21, Mr. J. Taylor in the chair, six new members were elected. A letter was read from Mr. Woodthorpe, town-clerk of the city, accompanying a copy of the medal struck off by Mr. Wyon to commemorate the Queen's visit to the city, and another from Colonel Pasley on the mode adopted for blowing up the brig William. A communication was read from Mr. Thornthwaite on a new apparatus for the use of divers, to enable them to fetch up articles with greater expedition, or execute with more facility any works below the surface of the water, and which had been used in the repairs of the gates at St. Katharine's Dock with great success. The principal advantage consisted in a volume of condensed air contained in a vessel, and regulated by a valve, so that the person employing it has immediate command over it. The silver medal was unanimously awarded for this invention. A description was next read of an apparatus by Mr. Bowles for raising empty casks, which consisted of a single catch introduced into the bunghole (similar to the end of a dog-chain), and the ingenuity of the invention was much admired. From Mr. Jones was exhibited a travelling platform for the purpose of descending ropes applicable to the repairs of buildings where ladders could not be applied, in descending cliffs for practical or geological purposes, or repairing wells or shafts, and for which the silver Isis medal was awarded. A report was read from the Finance Committee on the present state of the society's affairs. Amongst the extraordinary receipts of the past year was a donation of 500*l.* from Mrs. Acton, from donations 323*l.*, and a loan of 100*l.* from Mr. Solly, given without interest. The statement also exhibited the comparison of receipts and expenditure, the former of which was a little in excess.

NEW COLLEGE AT BATH.

A scheme is in progress at Bath to establish a college by shares, to be called Queen's College. It is to be something on the plan of King's College, London; and besides all the modern branches of education taught in the

University of London, is to include schools of engineering, navigation, arts, and design, and the application of science to manufactures, like the Paris Polytechnic school. The designs for the building are preparing under the direction of Mr. Manners.

ROME.

At the meeting of the Archeological Academy on the 17th May, the secretary, Visconti, read an account of an interesting and important discovery, made in a vineyard situated without the gate of Santa Maria Maggiore, near the church of SS. Peter and Marcellinus and the tomb of St. Helen. The proprietor was led, from some remains of antiquity found on the property, to examine an old neglected building, in the floor of which he discovered an entrance to a subterranean gallery, which had been filled with soil falling through apertures made in the ceiling for the admission of air. He caused the passage to be cleared, at a considerrble expense, and was amply rewarded by the discovery of a mosaic pavement, seventy-two palms in length, and five in breadth. He immediately caused the excavation to be examined by the learned secretary, who, from the close resemblance of the tombs to those in the catacombs, and principally from the emblems of the cross in the pavement, at once pronounced it to be a branch of the ancient cemetery known by the name of St. Tiburtius, SS. Peter and Marcellinus, and *inter duas lauros*. The gallery is of the same vaulted form as the other catacombs, but is higher and more spacious; along the sides, and in the transverse galleries which cross the main branch, are tombs about seven feet in length and two in height, hollowed in the wall, or in the form of altars with arches over them. The mosaic pavement is of the most elegant and varied design, and, besides the figure of a dove bearing an olive branch, ornaments, emblematic of the cross, are repeated in different form. We are inclined to believe, from an inspection of it, that the pavement was executed about the time of Constantine, and that a passage will shortly be discovered, connecting it with the well-known cemetery mentioned above.—*Dublin Review.*

MEETING OF SCIENTIFIC SOCIETIES.

Royal Institute of British Architects, Monday, 3rd and 17th instant.
Architectural Society, Tuesday, 4th instant.
Society of Arts, every Wednesday evening.

DISTRICT SURVEYORS.

At the last Middlesex Sessions, held on the 9th Nov., an election took place for two district surveyors. At the close of the voting the chairman announced that the choice of the magistrates had fallen on Mr. William Grellier and Mr. J. H. Good, jun. The former was appointed to the vacant office of district surveyor for the parish of Whitechapel; and the latter district surveyor for the parish of St. Mary, Stratford, Bow.

BELGIAN RAILWAYS.—BRUGES AND OSTEND.

BY A RECENT VISITOR.

The surface of the country is generally level, and the soil, sand resting on bog earth and light loam; on account of this flatness, no cutting exceeds four feet in depth. All roads are passed on a level: the canal is crossed twice by wooden turn bridges. A peculiar feature is, the breadth and shallowness of the ditches at the sides, from which the material has been obtained to finish the earthwork. This *prima facially* appears an unnecessary waste of land, but the necessity of it is seen, when it is considered that it is caused by the system of drainage, which would not allow excavations to be sunk deeper than a foot or two. The line is formed and packed with sand, and raised a foot or two above the level of the surrounding country. The rails, which at present are only a single line, are laid on wooden sleepers, and with very slight exceptions, appear firm. There are no side fences, and the shallowness of the ditches offers no impediment to men or cattle straying on the works. The rate of speed varies from twelve to four and twenty miles an hour, and the engines appear to work well, although the smell of the locomotives is more offensive than in England. The carriages are about ten feet broad, and being of Belgian make are rather jolting. Accidents are not unfrequent, arising from the self-sufficiency of the Belgians, who do not like to employ a sufficient number of English engineers.

A circumstance which should have an influence in comparisons between the cost of English and foreign railways occurred in this case. The Government took the land at a month's notice, without giving any idemnification for the crops, giving what price they thought proper for the land; it need not be said that there is some contrast between this and the English method of an opposition in Parliament, and a hard fought law-suit afterwards.

The system of administration seems very bad. The passenger has to pay his money at a pigeon-hole, which is closed by a glass door, the opening and shutting of which for every individual passenger at the last moment, it is needless to remark, causes considerable loss of time. The clerk having shut his window then sets to work to fill up, *sign and seal* the ticket. The applicant having done this begins to look about for his baggage, and while he sees it pitched down into the sandy mud, is directed by one of the establishment to walk into the passengers waiting-room. Seeing there no one to whom to refer, for, contrary to continental custom, the employées are not in uniform, although there are cuirassiers and infantry on sentry, he finds it necessary to look after his baggage, which after some difficulty he succeeds in getting arranged, after feeing the porters. Persons are not allowed to go from the baggage-room into the station-yard, but must return unnecessarily into the passengers-room. In the yard an officer takes the ticket or else takes it during the journey, and points out the carriage to be occupied. The first-class carriages are unnecessarily swelled in size by passages and doors, and there are no regulations against smoking, as indeed there are no other regulations visible. On arrival the officers at the station often require a ticket with the luggage, which, it is needless to say, is an unnecessary annoyance. The open carriages are indeed most miserable vehicles, without any covering at all; while the second-class carriages have badly arranged moveable leather covers. One bad feature in the administration is, that the guard or conductor receives fares on the road from passengers who have entered without a ticket; of course, in such case, there can be no efficient control against peculation.

RAILWAYS.

London and Brighton Railway.—The works on this undertaking are progressing with great rapidity through the whole extent of the line. At Clayton-hill, the shafts for the tunnel are nearly completed, and the drift-way is in a forward state; while the great work of the railroad—the embankment at Keymer—has been commenced by Mr. Thornton, who is employing a host of labourers. On the Shoreham branch the work is in a still more forward state. Nearly 100 yards of the drift-way of the tunnel, under Lashmer's-mill, has been accomplished, and men are engaged on the cuttings and embankments along the line for nearly four miles. Four bridges have been completed, and three others are in course of construction. Rails are temporarily laid in different places, for a distance of nearly two miles, and every part of the work is going on most satisfactorily.—*Brighton Gazette.*

Bolton and Preston Railway.—We are informed that nine miles of the length of this railway, commencing at Bolton, are already lined out.—*Preston Observer.*

Great Western Railway.—Cutting at Shooter's Hill.—One of the formidable obstacles in the line of the Great Western Railway, is that presented by the chalk hill on the western side of Pangbourn, which abuts on the banks of the Thames, about three-quarters of a mile in length. Excavations have been commenced at each end, and the soil, has been removed from the summit of the hill to a variety of depths; and the labourers have in this work turned up many testimonials that this hill was once the scene of a severe engagement. From six to eight feet deep in the chalk, they have found human skeletons, cannon-balls, pike-heads, and an ancient spur; and, within the last fortnight, horse-shoes so numerous as to fill a two-bushel measure. One of the men struck the pickaxe through a watch, the case of which was gold. The period of the battle, probably, was that when Charles I. advanced and retreated so often from Oxford to Reading, and from Reading to Newbury. The railway crosses the turnpike-road at Pangbourn, by a bridge of three arches; and also occasions at Purley, a diversion of the same road, to allow sufficient space for the railway between the turnpike-road and the Thames.—*Reading Mercury.*

Great Western Branch Railway from Slough to Windsor.—We have not thought it advisable till now to allude to the rumours we have lately heard respecting a branch-road from Slough to Windsor. But as an official notice of an intended application to Parliament for such branch appears in our advertising columns, and understanding that the money to bear the expense of the undertaking is ready, we venture to congratulate the inhabitants of this town, also those of Eton and Eton College, on the almost certainty of their having the advantage of a branch to the Great Western Railroad. The road, we understand, will branch from the Great Western between Slough and Salthill, will cross the Thames, and terminate close to this town. That the formation of this road will be a great benefit to the towns of Windsor and Eaton, there is no doubt, and by it also the conducts of the college will be relieved from the incessant noise of the numerous conveyances to and from Slough.—*Windsor Express.* Another meeting, between the leading men engaged in this undertaking, took place at the latter end of last week, and there is now every probability of its being carried into effect. It is intended to cross the river by the Brocas, and have the terminus in Clewer Fields, at the end of Clarence Crescent. The estimates have been carefully made; and upon what is represented to be a fair calculation, 10 per cent. on the outlay may be fully expected. —*Reading Mercury.*

The proposed Newbury and Great Western Junction Railway will be 14¾ miles in length. The estimated expense 145,000*l.*, and the gross revenue 24,500*l.* After quitting Newbury, and crossing the river Kennet about two miles below the town, it will go by Thatcham, Midgham, and Woolhampton, to near the 46th milestone, where it crosses the London and Bath road, thence proceeding nearly in a straight line, leaving Theale on the right, thence by Tidmarsh to Pangbourn, where it will join the Great Western Railway, making the entire distance from Newbury to London only 55 miles, which may be accomplished in two hours and a half. Mr. Schollar, the engineer, considers the above line to be the most eligible, and also the cheapest.—*Reading Mercury.*

Maryport and Carlisle Railway.—We understand that contracts have been completed for blocks, &c., for eight miles of this line. These eight miles lead through coal and lime, and will, it is confidently expected, be completed before September, 1839. The present traffic in coal alone would yield a gross profit of 8 per cent., and this on a reduced charge to the coal-owners, for carriage, of one-half the present cost. There is, therefore, every probability of doubling this coal traffic.

Southampton Railway.—The bridges constructed by the Southampton Railway Company across the Great Western Road at Worting, near Basingstoke, gave way last week for the second time, to the imminent danger and annoyance of travellers.—*Times.*

Midland Counties' Railway.—The following is the engineer's return of the quantity of earth-work executed, and the number of men, horses, and engines employed, on the works of the Midland Counties' Railway, from the 22nd of September to the 27th of October, 1838:—Earth-work executed, 284,160 cubic yards; number of men, 4,597; number of horses, 498; engines, 1 locomotive, 1 stationary.

The Eastern Counties' Railway.—The unbelievers of Essex are now in a state of amaze at the rapid progress of this railway. They formerly would insist that it never would reach Romford; but the line is now not only nearly completed to Romford, but the bridge over the highway from that town to Hornchurch, nearly finished, and the contract let, and rapidly proceeding with to Brook-street and Brentwood.—*Essex Standard.*

Dundee and Arbroath Railway.—Since the opening of the line, upwards of 2,800 passengers have travelled upon it, and the numbers are daily increasing. We understand that it is in contemplation to form a branch Railway to Montrose, which will still further insure the traffic, so that in every point of view this undertaking promises to be eminently successful.—*Glasgow Courier.*

Birmingham and Gloucester Railway.—It is said that the portion of the line between Cheltenham and Tewkesbury will be opened next spring. The excavations under the Gloucester road at Cheltenham have been commenced, and the cutting for the depôt is nearly completed. The designs for the latter have been for some time in preparation, and will be in the builder's hands in course of a week or two from the present time.—*Gloucester Chronicle.*

Welsh Coast-Line Railway.—George Stephenson, C.E., one of the highest authorities on railway matters, having been on a geological tour in North Wales, has examined the route of the coast-line of railway, so frequently adverted to in this journal, in contradistinction to the interior line so foolishly recommended by the Irish Railway Commissioners. The following are his sentiments respecting it, communicated to John Uniacke, Esq., Chairman of the Chester and Crewe Railway Directory:—"Dear Sir,—As I was engaged, last week, in a professional tour through Wales, in examining the geology of a portion of the country, I took the opportunity, in returning home (knowing the interest the people of Chester feel in having a communication to the Ormshead), to examine that bay, and the route from that place to Chester, as well as from Ormshead to Bangor. I find that the bay at Ormshead possesses more facilities for being made into a convenient harbour than I had any previous idea of, and that a railway may be obtained from that place to Chester almost on a dead level, and without having to encounter any heavy or difficult works; and, also, from what I saw of the country between Ormshead and Bangor, I do not think there are any difficulties to prevent a railway being made from Chester to Holyhead, if Government should hereafter be disposed to assist in carrying the communication to that point. If the line, in the first instance, is only carried as far as Conway, it would still leave that portion of the great north road from Conway to Holyhead available for the traffic between England and Ireland, and it would then remain with Government to consider whether they would still retain Holyhead on the grand station for the thorough fare between England and Ireland, or they would make the Ormshead the great packet station. It is my opinion, that no other route can be obtained, at so small a cost, to shorten the distance from England to Ireland."—*Chester Chronicle.*

Railway from Newcastle to Edinburgh.—The survey of this proposed railway will proceed with great rapidity, as it is to be carried on simultaneously in four sections, beginning from the two extremities and two intermediate points. It has already commenced at Newcastle and Berwick. A distinctive name should be contrived for this railway, which will serve the important purpose of uniting the two kingdoms. Might it not be called the Grand Union Railway?—*Scotsman.*

Birmingham Railway Station.—The great inconvenience arising from the destruction of the Denbigh Hall station is about to be remedied by the establishment of another, at the Bletchley Cross-road, about half a mile from Fenny Stratford, agreeably to the request of a large number of the gentry and farmers of that vicinity.—*Bedford Mercury.*

The Chevet Tunnel on the North Midland Railway, near Wakefield.—This stupendous undertaking, the work of many months, is at length opened, we understand, at both ends. It is about three-quarters of a mile in length, and in some places nearly thirty yards under ground. The line in the neighbourhood is fast progressing, as well as the viaduct over the Barnsley Canal, which will be a gigantic specimen of art.—*Leeds Mercury.*

Liberal Landholders.—At the Cork Railway meeting, Sir W. W. Beechey and Mr. J. D. Croker said they would not require any compensation for land of their's required for the South Western Railway. [This is somewhat contrary to the general practice of the squirearchy, and is an example much to be recommended.—Editor.]

South Eastern and Dover Railway.—We have paid our periodical visit to the works of this railway, to mark their progress. Our readers are aware that the galleries and shafts of the important tunnel at Shakspeare's Cliff are already complete, and we have now to notice that the two headways are progressing most satisfactorily. The chalk hitherto excavated is of extraordinary firmness, and fully realizes the expectations of the engineer,—that the roof of the tunnel will in no part require any extraneous support beyond the natural chalk. About four weeks hence, should the working continue as favourable as hitherto, we may congratulate our readers upon the possibility of walking through the bowels of this noted cliff. The cuttings beyond are proceeding rapidly, and still further, the second tunnel has been commenced under very favourable appearances.—*Dover Chronicle.*

London and Birmingham Railway.—Mr. Berry, who is an extensive engine manufacturer, and occupies several acres of land at Wolverton, the principal engine station on the line, has contracted with the directors for working the train of carriages the entire distance at one halfpenny per ton per mile for goods, and also at the rate of one farthing per ton per mile for passengers. The carrying department is under the management of Mr. Baxendale. The coaches recently purchased off the road are the Swallow and the Wonder, which have been carrying outside passengers at 10s. and inside at 20s. each.—The latter coach has run from Shrewsbury to London daily for several years, and admitted to have been one of the best conducted coaches on the road for its regularity.

Proposed New Railway from London to the North.—A new line of railway has just been projected, to be called the North Trunk Railway. It is proposed to commence at Islington, passing thence between Highgate and Hampstead by Finchley, Barnet, St Albans, and Bedford, between Higham Ferrers and Wellingborough, and thence to Leicester, there to join the Midland Railway This route would form a portion of a direct line from London to Edinburgh The project is sure to receive the strenuous opposition of the London and Birmingham Company, with whose traffic it would interfere very materially.—*Evening paper.*

Thames Haven Dock Railway.—The works at this Dock are progressing very fast, as far as the excavation part; and several houses have been built close to the sea wall for the occupation of the labourers. We understand this company proposes to lay four lines of rails with a six feet gauge, and to carry at extreme speed on one set, and at the most profitable rate for goods and coals on the other, this will be working out the principle of railways and locomotive power to advantage and profit. We further hear that this undertaking is fully appreciated in Belgium by all persons, from the King downwards, and that the remaining shares in the office will be taken in that country. This is discreditable to ourselves in foresight and enterprize. If the work be a good one it ought to be carried through by British capital. There cannot be a doubt that a large tide dock in such a position as that of Thames Haven, so near the entrance of the river, and within one hour's distance of the Metropolis, will command an enormous trade and traffic, the line being nearly level and straight throughout; the undertaking cannot fail to be highly beneficial to the public and profitable to the proprietary.

The Preston and Longridge Railway.—This line of railway commences, at its eastern extremity, in a field on the western part of an estate near Longridge, lately purchased by the Railway Company, situate in the township of Dilworth, and is about 200 yards from the highroad leading from many of the trading towns of the eastern parts of Lancashire and Yorkshire, to Preston; it is the same distance (about 200 yards) from the celebrated stone quarries called "Tootal Heights." The entrance to the railway is cut out of the solid rock, with which material the estate abounds. From this entrance there is a fine view of the Chipping-hills, and the diversified scenery which adorns the landscape below. The railway in this place, from the entrance, extends in a straight line about 200 yards, at the termination of which length it is continued in the form of a curve, over a viaduct of one arch, which is being erected over the tramroad called "Wilkinson's Old Lane." It then extends in a direct line for about three miles, leaving, on the south side, the village of Longridge at a distance of about 300 yards; it then passes under another bridge, built at the Four Lane-ends, in the township of Alston; to the west, or rather north-west of which is the beautiful mansion called "Gleadale House," late the residence of James Dilworth, Esq., which lies within a few hundred yards from this part of the line. In this locality the railway is about 200 yards from the public highway to Preston, so that any weight or bulk of goods of any kind, might be readily conveyed from the station-house that will, in all probability, be erected near the Alston Four Lane-ends bridge. The road, further west, proceeds towards the Plough Inn, in Grimsargh, which it passes within ten yards of the front door, having to the right the elegant residence of James Blanchard, Esq., and is carried in a straight line to the eastern part of the Parsonage-house in Grimsargh, occupied by the Rev. Mr. Grainger. To the south is the antique residence, called Red Scar, the seat of Mrs. Cross, relict of the late W. Cross, Esq., which mansion is surrounded by a profusion of beautiful scenery. In this direction is another bridge, built of wood, under which the line is constructed; it then passes the garden of Grimsargh School, and thence, without any material angle or curve, proceeds under another bridge. near to Ribbleton brow. Thence it proceeds in a regular direction to the terminus, near to St. Paul's Church, Preston.—*Preston Chronicle.*

Chester and Crewe Railway Company.—Engineer's Report on the Line.—The entire distance from Chester to the Grand Junction Railway has been for some time staked out, levelled, surveyed, and the plans of landowners prepared. The line has been divided into four contracts, the heaviest of which was let in July. The next (in point of work), the Crewe, has also been contracted for and commenced. The two remaining divisions, Bunbury and Wardle, present no difficulties of consequence, and need not be commenced upon till the ensuing spring. The following statement will explain the nature and extent of the works upon each:—Waverton Contract, let to Mr. Thomas Brassey; amount, 56,500*l.* The length of this contract is six miles and four-fifths, and it comprises 392,500 cubic yards of excavation, an aqueduct at the crossing of the Ellesmere and Chester canal, three turnpike-road bridges, three public-road bridges, and seven occupation bridges. The works were commenced upon the 8th of August, and up to the 1st of November 75,000 cubic yards were taken from the first excavation, being upwards of one-fourth. Two bridges are building; a considerable distance of the line is fenced; and the whole is proceeding in such a manner as to leave no doubt as to its being done by the 1st of February, 1840, the time specified for completion. In the beginning of a work, the difficulty of obtaining and getting materials upon the ground retards the contractor's progress, so that the quantity done in the first two months affords no criterion of what will be done in the two ensuing. The Bunbury Contract comes next in order. The length is five miles thirty chains, and include 260,000 yards of earth-work, one turnpike-road bridge, four public road bridges, and one bridge at the crossing of the Ellesmere and Chester canal. The length of the Wardle Contract is four miles six chains. It contains 204,000 yards of excavation, one turnpike, three public road bridges, and one bridge over the Middlewich branch canal. The drawings of the bridges and necessary contract plans have been prepared for these two divisions, but from their extreme lightness need not be let till the spring of next year. This will not occasion any delay in the opening of the whole line. Crewe Contract, let to Mr. Brassey; amount, 36,973*l.* This division is four miles two chains long, requires 292,000 cubic yards of earth-work, one turnpike, three public road bridges, four occupation road bridges, and one river bridge at the Weaver. The principal work is the Weaver embankment, to which the whole energies of the contractor will be directed; and though it depends in some measure upon the weather yet I have no doubt that, with proper care and attention, the whole will be completed within the period specified. The other embankment up to the Grand Junction Railway is of no moment.

Kingstown Railway.—At a meeting at Waterford, Mr. Bald, the engineer, who was present, stated that the Kingstown Railway pays six per cent. to the proprietors, but their shares are below par, from an arrangement to clear off their debt to the board of public works within a certain period.

The Accident on the Birmingham Railway.—On Friday morning, Nov. 9, about twenty minutes past three o'clock, an accident of a serious character occurred on the line of the London and Birmingham railroad, about three miles on this side of Leighton. The train started at its usual hour from Birmingham, with about fifty passengers, the Post-office letters, and luggage. On arriving about three miles and a half on this side of Leighton, where the road runs along an embankment 90 feet in height, the engine and tender got off the line in the direction of the embankment, and before it was in the power of the engineer to check its progress it had proceeded, dragging with it the greater portion of the train, right over this steep declivity, producing a concussion, which dashed the Post-office luggage-van and one of the first-class carriages to pieces, and seriously damaged the whole of the remainder. The escape of the engineers, guards, and passengers, was truly providential. The engine, after having gone down the declivity a considerable distance, became, from its immense weight, so deeply imbedded in the mould that the wheels were entirely clogged, and it fell upon its side towards the mound, which had the effect of throwing those carriages which were over the embankment in the same direction, and those remaining still on the line on their sides the reverse way. The confusion at this moment is described to have been dreadful. On the engineers, officers, and guards recovering the shock, it was found that among the passengers, with but one exception, only a few slight bruises had been sustained, and that a gentleman, who was seated alone in one of the first class carriages, was bruised about the thigh and hips by the force with which the panelling had been dashed in against him. One of the guards, named Young, was found lying at the bottom of the embankment, bruised in a most shocking manner, having been at the time of the concussion pitched, together with the foot-board and iron work of the dickey of the carriage on which he was seated, the whole depth of the declivity. He was assisted up, and placed in one of the carriages, in a weak state, but we are happy to state his injuries are not of a serious nature, as he managed to walk to his residence on the arrival of the train in town.—*Evening paper, Nov. 12.*

Explosion of a Locomotive Engine Boiler on the Liverpool and Manchester Railway.—On Monday evening, the 12th ultimo, the luggage train, which left Liverpool for Manchester, met with an accident which terminated fatally to the engineer and fireman on ascending the inclined plane at this place. The train consisted of 43 waggons, and was propelled by four engines, two in front and two behind. The rise of the road is about 1 in 90 feet, and the train, at a few minutes past eight o'clock, was seen advancing slowly up the hill at a steady pace, when, all of a sudden, the Patentee, the first engine, exploded with a noise resembling the firing of cannon, the report being heard at Prescott and other places more than a mile distant. The engine broke away from the rest of the train, and proceeded at a flying pace for 300 or 400 yards along the line. It was sadly shattered, and the tubes destroyed. A search was made for the engineer and fireman immediately on the train stopping. Both were killed, but none of the engineers or breakmen on the other engines received any injury; their escape is attributed to the tender attached to the Patentee engine having formed a resistance to the power of the exploded steam.—An inquest was held on Tuesday the 13th ultimo on the bodies of the two unfortunate sufferers. William Thomas deposed, that he was a watchman in the employment of the Manchester and Liverpool Railway Company. Last night he went on duty rather before his time, and while sitting in his box heard an explosion, and running out saw an engine flying past him. He had heard the train regularly working up the hill just before the explosion. On going out, he ran after the engine, which was the Patentee, and had run about 160 yards from the place where the explosion occurred. He found the engine detached from the tender. There were no firemen with it, and the back of the engine (the fire part) was blown away, and one of the tubes was hanging out. Witness had frequently seen the deceased "weighting" the safety-valves. He knew that the Patentee engine had been running for more than two years. Two other engines followed the train. It was dark at the time the explosion took place.—Mr Melling, engineer to the company, deposed, that he had seen the Patentee engine since the accident. The furnace end was blown out. Witness could not account for the accident. If there had been a scarcity of water, the leaden plugs would have melted, and the fire would have been put out. A burst tube would have produced the same effect. The company strongly prohibit the road engineers from "weighting" the engines, and would discharge them on its being made known that they did so. They had no right to press on the levers. Witness could not state positively whether the Patentee had a safety-valve placed out of the control of the engineers. Some of the engines have three safety valves. The Patentee had run about five years, and belonged to the Manchester end of the line. The boiler was about a quarter of an inch thick, and was calculated to bear a pressure of 50 pounds to the inch. No injury was done to the tender, except the breaking of the drag link, used to attach it to the engine. If the deceased men had the steam up at too great a pressure, and then applied pressure to the safety valves, an explosion might be the consequence. It was more dangerous to apply pressure to a boiler when the engines ascend an incline than on level ground, the steam in the latter case escaping much faster.—Richard Greenall, the road engineer to the Bank engine, which is kept in waiting at the foot of the incline to assist the trains in their ascent, deposed, that he and the other engineers last night, in consequence of their having the assistance of the Lion, a new engine, agreed to take the whole train, which consisted of 43 waggons, up the incline at once. Having four engines in the whole, he thought they had plenty of power, as the Hercules had on a previous occasion by herself taken up 17 waggons, and the Patentee 16 waggons. The two hindmost engines had scarcely felt the incline when the explosion took place. Witness had occasionally seen engineers apply weights to the engines, and thinks there is scarcely an engineer on the line who does not do so at a pinch. Warburton wished to go up the line with 33 waggons only; but the firemen agreeing with witness in the probability of getting the whole train up the incline, they started with 43.—The jury returned a verdict of "Accidental Death," with a deodand of 20s. on the engine.

FOREIGN RAILWAYS.

Railway from Odessa to Vienna.—A letter from Lemberg, in Galicia, of the 24th of September, says, that a company of rich inhabitants at Brody has proposed to the Austrian and Russian Governments, to construct, at its own expense, an iron railway from Brody and Lemberg to Vienna, and from Brody, by way of Berdztscheff, to Odessa, on condition that the Company shall have the two roads for one hundred years; after which they shall belong to the two states. It appears that the Company has already some hope that the Austrian Government will accede to the proposal, for its engineers are already commencing the line from Brody to Vienna, and its agents have conferred with several landowners in Galicia, about the purchase of the land through which the road would pass. The Emperor of Russia, it is said, has the less hesitation about authorising the construction of an iron railroad between Brody and Odessa, as he much desires to see railways become numerous in his empire, and as the Company does not ask any pecuniary aid. It is affirmed that the houses of Rothschild and Sina, of Vienna, and the wealthy Hungarian Count Czetching, intend to take shares if the plan should be realised.

Berlin.—The opening of the railway between that capital and Potsdam took place on the 29th of October.

Austria.—The number of passengers on the North Austrian Railway between April 16 and October 15, was 165,879, and the amount received 71,099 florins.

Ostend Railway.—Active measures are in contemplation to remove the station which is now outside the town, to a position nearer the harbour.

Portuguese Railways.—A railway was some time back in contemplation between Lisbon, Coimbra, and Oporto, but was necessarily abandoned on account of the distracted state of the country. The guerillas have lately committed many murders on that road, and any engineer engaged in operations on that line would be likely to make a *final* survey.

Dresden Railway.—Another six miles of the railway between Dresden and Leipsic was opened on the 3rd inst. It extends from Dahlen to Oschatz.

Bruges Railway.—The station is being improved, and a canal filled up in order to extend its limits.

Belgian Railways.—A great deal of flourish has been making by the vainglorious Belgians and their neighbours, the French, about the wonderful progress of Belgian railways; it should be borne in mind, however, that most of them are but single lines of rails.

Versailles and Meudon Railway.—A general meeting of the shareholders in this line was held on the 10th. From the report it appeared that, according to the survey and plans of M. Correard, verified by the Council of the Ponts et Chaussees, and approved by the government as the basis of the grant of the line, that the total expenses of the undertaking was estimated at less than 4,000,000 francs. It has since proved that the road, as far only as it hast hitherto been carried, has nearly absorbed 8,000,000 francs, and must definitively cost, according to the best calculations, 15,000,000 francs. [We recommend this to the attention of our House of Commons.]

Versailles Railway.—It is said the two companies have agreed to unite, so that there will be only one entrance for both lines at Versailles, the point of junction being made in the valley somewhere beyond Sevres, and the starting point of the Meudon line may then perhaps serve for that of the line intended to be directed on the south-west of France, by Chartres, Tours, &c.—*Galignani.*

ENGINEERING WORKS.

Montrose Bridge.—We understand that a communication has been received from the Exchequer Loan Commissioners (who are now *de facto* the Bridge Commissioners), intimating their intention to repair the structure forthwith, and that Mr. Rendel, civil engineer, is with that view on his way hither. The question, what is to be done to secure a more stable and permanent medium of communication at this ferry, remains to be decided by the Treasury. The bridge has been inspected since our last by Mr. Rendel, Government engineer, who, in a report delivered to a meeting of the commissioners, confirmed the statement we formerly gave respecting the extent of the casualty. The main chains, he reported, remain uninjured; and although the roadway will require to be thoroughly reconstructed, the bridge may be temporarily repaired, and rendered passable for both foot passengers and carriages in about a month, at an expense of 450*l.* The commissioners resolved to proceed with this repair in the beginning of next week, and to memorialise the Treasury for authority to effect the reconstruction of the roadway on an improved principle, recommended by Mr. Rendel, next season.—*Montrose Review.*

Lighthouse on the Barlings.—The Director of the Customs at Lisbon, has, issued a notification for tenders to be sent in for the erection of a lighthouse on the Barlings, which has been so much wanted on those dangerous impediments to the entrance of the Tagus, and so long talked of.—*Diario do Governo.*

Bristol.—The clearing out of stones and trees which impeded the navigation of the Severn, has just been finished. The works on the Clifton Suspension Bridge are in full vigour, but it will take some time before the towering piers are completed.

Floating Steam Bridges.—In the transactions of the Institution of Civil Engineers, reviewed in our number of this month, is an account of the floating steam bridge over the Hamoaze, on which we may remark, that, in addition to this machine, another is in active operation at Southampton, and one is now in progress to ply in Portsmouth harbour. They are found to be profitable undertakings.

Mr. Beaumont, late M.P. for Northumberland, has subscribed 10,000*l* towards the building of a new bridge across the Tyne, near Hexham. It is said he contemplates likewise the erection of a splendid mansion on his own estate in that neighbourhood.—*Standard.*

Temporary Suspension Bridges.—A correspondent suggests that rope bridges might be used to a much greater extent for communication in poor districts, as in the mountains of Ireland. In Sir A. L. Hay's recent work on the Peninsular war, among the descriptions of several engineering operations is one of the rapid construction of a rope bridge, over which the whole army, with cavalry, artillery, and baggage, passed with safety, while its cost was comparatively trifling, and the materials furnished from the campaign stores.

STEAM NAVIGATION.

Government Steamers.—Pembroke Dockyard is very active now in the construction of steamers, several being now on the stocks, and one launched nearly every month.

Coppering before Launching.—The Merlin steam-boat was launched at Pembroke Dock-yard, on the 18th of last month. She is intended to carry the mails between Liverpool and Kingston Harbour. She was wholly coppered on the stocks, by which government saved the expense of taking her into dock. To save the copper from being injured by the cradles, they were fastened by ropes running underneath the keel, and by abutment pieces extending to parts above the counter.—*United Service Magazine.*

Paddlewheels.—The Megera has returned from the Mediterranean on account of the defective state of her paddlewheels, which are constructed on a principle, which in itself perhaps is good, but which is said to be liable to strong objections in practice, in consequence of the friction resulting from the mode of working. Some of the bolts upon which the joints of the paddles turn, after being in use about six months, are worn down from three inches to 1 inch in diameter.—*United Service Magazine.*

French Steam Navigation.—A steam-boat is going to ply on the Isere, from its junction with the Rhone, to Grenoble. The new communications which will thus be opened for goods coming from Savoy, Piedmont and Italy will be of the greatest importance.—*French paper.*

Mediterranean Steam Navigation.—The number of travellers passing through Marseilles for Italy and the Levant is unprecedented. The last packet, the Mentor, conveyed 117 passengers, many of whom were obliged to sleep in their carriages or on the cabin benches.

Indian Steam Navigation.—Two out of the five stations intended to be erected between Suez and Cairo are already in activity, and greatly facilitate the intercoure between those cities.

American Steam Navigation.—A steam-boat to communicate between New York and Bordeaux, has lately been launched at this latter port, which is one of the principal in France for its river steam navigation.—*Memorial Bordelais.*

Black Sea Navigation.—The government has lately purchased, in England, two iron steam-boats, the Inkermann and the Newka. The first is intended to ply between Constantinople and Odessa. It arrived at Odessa the 9th ult., having performed the voyage from London in 39 days.—*Hamburgh paper.*

French Steam Vessels.—The French government have advertised for 21,000 tons of coals, for the service of the Medeteranean packets.

North American Steam Navigation.—The government have advertised for tenders to convey the mails by steam vessels, of at least 300 horse power, from England to Halifax, and from England to Halifax and New York.

NEW CHURCHES.

New Church at Rotherhithe.—On Tuesday, Nov. 6th, the ceremony of the consecration of Holy Trinity Church, in the parish of St. Mary, Rotherhithe, was performed with the usual ceremonies by the Bishop of Winchester. The new church is a spacious edifice, in the pointed Gothic style, capable of accommodating 1,000 persons, situate in the lower part of Rotherhithe, near the Commercial-dock, about a mile and a half from the old parish church, and in the midst of a very populous district, where the want of a church has been long and deeply felt by the inhabitants. A grant of 2,000*l.* from the Metropolis Churches Fund, 1,000*l.* from her Majesty's Commissioners for Building and Enlarging Churches and Chapels, and 500*l.* from the Incorporated Society for Building Churches, has been given towards the erection, and besides 100*l.* from the master and fellows of Clare Hall, 50*l.* from the rectors, 50*l.* from Mr. W. Bennett, the shipowner, the same sum from Major-General Sir W. Gomm, and 25*l.* given by Mr. W. Evans, M. P., about 360*l.* has been subscribed by the inhabitants. The total expense of erection and the endowment for the minister is 5,770*l.*, of which 4,060*l.* has been collected, leaving a deficiency of 1,709*l.* Attached to the church are two spacious infant schools, one for boys and the other for girls, which have been recently erected by the voluntary subscriptions of the parishioners.

Westmoreland.—A new church, to be named "St. George," has just been commenced at Kendal, on the north-east side of the river Kent, between Stramongate-bridge and Kent-terrace. The design is of the early Gothic style; the principal front contains, in the centre, a large triple lancet-arched window, and the principal entrance under; at the angles are large octagonal spiral turrets; and on the east side are two porches, which, with the principal entrance, communicate with the vestibule. The interior arrangements have been planned with every regard to comfort and convenience. The vestibule occupies the whole width of the west end; the centre of the church, and surrounding the pulpit and altar, will be occupied with free seats, and a gallery will extend along the two sides and the west end, approached by stone staircases in the turrets. The main timbers of the roof will be exposed to view, and arranged so as to give them an ornamental appearance; the ceiling will be three-sided, and ornamented with diagonal mouldings in stucco, and enriched cornices. The nave of the church will be 83 feet long, 50 feet wide, and 40 feet high; the altar recess is 24 feet by 10 feet. The cost of the church alone (which is to be built of beautiful white limestone) will be about 3,500*l.*; and the enclosure (a handsome Gothic railing), and the furniture of the grounds, with incidental expenses, will amount to about 700*l.*, making the total cost 4,200*l.*, the funds of which are raised thus:—Commissioners for Building New Churches, 1,000*l.*; Incorporated Society, 400*l.*; the remainder by voluntary subscriptions. The Lords of the Manor, viz. the Earl of Lonsdale and the Honourable Fulk Greville Howard, presented the ground upon which it is to stand, in addition to other subscriptions by them. With this edifice Kendal will have three churches, standing at the three extreme angles of the town, which will together afford accommodation for about 3,500. Population about 13,000. Mr. Webster, of Kendal, is the architect.

Church Consecrations.—The Lord Bishop of Ripon during last month consecrated three new churches in the archdeaconry of Craven, Lothersdale, Stoneyhurst-green, and Settle. Lothersdale church is the first church which has been built and consecrated in Craven for the last 300 years. We cannot omit to notice the munificent gift of 1,000*l.* from the Rev. Walter Levitt, B.D., the vicar of Carlton, towards the endowment of the church. The new church at Stoneyhurst, or Hurst-green, has been built under peculiarly interesting circumstances; and the situation is romantic in the extreme. The consecration of the new church at Settle was attended by the most influential families in the neighbourhood. The peculiar feature in this consecration is, that amongst the largest contributors to the new church are several members of the Society of Friends—a circumstance highly creditable to them, and valuable to the friends of the church.—*Times*, Nov. 10.

PUBLIC BUILDINGS AND IMPROVEMENTS.

Metropolitan Improvements.—We are glad to see several notices for application to Parliament for forming new streets in different parts of London. In the city, an application will be made to form a new street from Moorgate to the New Post-office, parallel with Cheapside, and to widen Bartholomew-lane. Another important improvement is for forming a new street and viaduct nearly parallel with Holborn and Skinner-street, to commence the corner of Fetter-lane, and pass across Bartlett's-buildings, Thavies-inn, the back of St. Andrew's Church, over Shoe-lane and Farringdon-street, and terminating at the corner of the Old Bailey and Skinner-street, immediately opposite Newgate-street; the street will be nearly a level, and will avoid interfering in any way with the houses, either in Holborn or Skinner-street. At the west end an application will be made for forming a street from the Houses of Parliament to the New Palace, and for forming squares, and other improvements, on the south side of St. James's Park. The Crown have also given notice for taking down all the houses forming a square; Downing-street on the north, Lower Crown-street on the south, King-street on the west, and Duke-street and St. James's Park on the east, for the purpose of forming a new street from King-street to Duke-street, and building public offices. Another application will be made for forming a new street from Carey-street to the Strand, and also for forming a communication between Pall Mall and King-street, St. James's-square.

Batteries.—Colonel Ward, of the Royal Engineers, and other surveyors, are now visiting the ports of Cumberland, and reconnoitring their capabilities of defence, with a view to erect batteries, and make other preparations of defence and precaution, in the event of a foreign war.—*Whitehaven Herald.*

A whole-length statue of the late Viscount Downe, executed by Chantrey, has just been erected in Snaith Church, Yorkshire, to the memory of that highly respected nobleman.

The Gordon Monument.—Elgin.—The committee appointed for erecting a monument to the memory of the Duke of Gordon, on the Ladyhill, met in Elgin on Tuesday last, and agreed with Messrs. Brander and Shand, masons, for executing the work at the sum of 1,240*l.* The work will be immediately commenced, and the structure, while it will perpetuate the memory of the noble duke, will also be a great ornament to the town.—*Elgin Courant.*

The Monument of Nollekens.—A monument to the memory of this celebrated sculptor has just been erected in Paddington church, in which edifice the mortal remains of the deceased have been deposited some years. Why the monument was not put up before, it would be difficult to conjecture; the veteran artist left plenty of money behind him to persons who might have defrayed the expenses of such a testimonial, and sufficient reputation to make it a matter of surprise that anything niggardly or dilatory should have retarded its erection. Be this as it may, the monument is at length put up. It is the work of Mr. Behnes, and it is a work that will add to his reputation, and show, that however excellent he may be as a carver of busts, he can do other and more difficult things equally well. The monument is of white marble; on it is represented a sarcophagus, on the front of which is carved, in very bold relief, the figure of Nollekens, employed upon one of his principal works—the monument of a lady who died in child-birth. The group is very fine; the attitudes of the figures graceful and easy, and the body of the dead child relaxed in the moment of dissolution but stiffening into the rigidity of death. The likeness of Nollekens is a correct one; it has the character and mannerism of the old man, and portrays his peculiar look with great fidelity of imitation. The monument should have been erected years ago; it is, however, consolatory that it is at length erected, and that the execution of it has been intrusted to an artist capable of doing justice to the subject.

FOREIGN INTELLIGENCE.

Paris.—The pediment over the portico of the Chamber of Deputies is about to be cleared of the figures that now occupy it, and will be filled with a new alto-relievo by M. Carlot. M. Pradier is charged with the execution of the basso-relievo on the wall to the left hand of the portico, and M. Rudde with those to the right. The basso-relievo still wanting in the body of the chamber is to be supplied by the chisel of M. Ramey, and M. Guérard is engaged to execute the groups which are to be placed on the pedestals in the Cour d'Honneur.—*Paris paper.*

Conservatoire des Arts et Metiers.—A commission of men of science and manufacturers has been appointed to draw up a report for the re-organization of this valuable institution.—*Memorial Bordelais.*

Palais de Justice.—The Council-General of the Seine, or Board of County Magistrates, has voted a sum of 7,500,000 francs (300,000*l.*), to be applied to the restoration and enlargement of the Palais de Justice.—*Galignani's Messenger.*

French Waterworks.—The Municipal Council of Versailles has voted a sum of 400,000 francs (16,000*l.*), and applied to government for a grant of 1,500,000 francs (60,000*l.*), for the purpose of enabling the town to be supplied with an additional quantity of water, by taking advantage of the works recently finished at Bezons, a little above Marly.—*Galignani's Messenger.*

Rouen.—A society has opened a subscription for the purpose of making researches throughout the department of the Seine-Inferieure for coal, it being expected that several extensive formations of anthracite, sufficient to repay the expense of working, may be met with.

Belgian Prices of Footpaths of Asphalte de Lobsan.—For any quantity under 25 square metres, or 29 square yards, plain, 6f. 50c. (5s. 2d.); lozenged, 6f. 75c. (5s. 4d.). For any other quantity per 25 square metres, plain, 6f. (4s. 9d.); lozenged, 6f. 50c. (5s. 2d.).

Belgium.—The city of Courtrai has this year been lighted with gas, and it is also in contemplation to extend the same system of illumination to Bruges.

Ostend Mails.—There is some talk of the mails for England being sent by Belgian steam-boats to Ramsgate, which used to be the English packet station previous to its removal to Dover.

The Dutch papers state that a commission appointed by the King of Holland has submitted to his Majesty a plan for the establishment of a great commercial entrepot and dock at Rotterdam, chiefly for the benefit of the navigation of the Rhine. This important plan is said to be connected with the making of a branch of the iron railroad to Arnheim, which is to begin at the entrepot and join at Utrecht the Amsterdam railroad.

Hamburgh.—The new English church, which is a handsome structure, was opened for divine service on the 11th instant.

Educational Despotism in Gerome.—The Ministers of Public Instruction have addressed a circular to the Rectors of the University, recommending them to compel the heads of private establishments, and schools of secondary instruction, to send pupils above the age of ten years, to the classes of the colleges, conformable to the University regulation.

Neapolitan Mines.—Mr. Beck, an Englishman, has obtained from the government the exclusive privilege of extracting all mineral substances, as coal, bitumen, alum, &c., throughout the kingdoms of Naples and Sicily. The company established to work these mines is possessed of considerable capital. The royal patent is dated the 24th of September.—*Malta Gazette.*

Venice.—During the presence of the Emperor of Austria at Venice, he laid, with great ceremony, the first stone of the breakwater about to be constructed at the port of Malamoco.—*La Presser.*

Prussia.—Prince Albert has just laid the foundations of a magnificent palace at Kamentz, in Silesia.

Swedish Iron.—By a recent decree, the King of Sweden has freed bar iron from monopoly, and proprietors of forests, or mines, are allowed to erect works on their own premises. The manufacture of iron in Sweden, however, is still greatly embarrassed by the trammels of law.

Russian Coal Mines.—A person sent by Count Worowsow has discovered a very rich stratum of coals, adapted to the use of steam-boats, in the south of Russia, in the mountain of Soukhia Yalta, 80 wersts from Marienpol and 180 from Alexandrousk, and accessible from the Dnieper.—*Journal de St. Petersburgh.*

Danube Navigation.—Since the occupation of the mouth of the river by the Russians, their efforts to destroy the trade of the Moldavian ports of Braila and Galatz, have been unceasing. Having been defeated in these attempts, they have now commenced one of more promise, and have neglected to clear off the accumulations of sand from the Black Sea which the Turks used to remove, and which now threaten to destroy the navigation.

Turkish Canal.—The canal to join the Danube (on the line from Rosova to Chiutenza) is to be restored by the Danube Steam Navigation Company. A recent firman authorizes them to repair this old Roman work.

Egyptian Canal.—A company has been formed at Alexandria for the navigation of the Mahmoudie Canal, executed by the Pasha. The object of the company is to facilitate the communication from Alexandria to Atfe, and an active and regular service of boats towed by horses was to be established.—*Semaphore.*

Alexandria.—Great improvements in building are taking place in the Place Manschee, due principally to the example of Ibrahim Pasha. Several Europeans have erected commodious houses on the same site, and those edifices altogether formed an oblong square 1,290 French feet by 200. There are at Alexandria two theatres, one French and the other Italian, and a Philharmonic Society. Another Italian theatre, planned by an Italian architect, and capable of containing 600 persons, is erecting.—*Semaphore.*

Algiers.—The French have added a new portico to the Grand Mosque.

Algerine Antiquities.—The Roman remains of Russicada (now Stora) are stated to be well preserved, and in particular an amphitheatre, two temples, and a magnificent cistern or fountain.—*Galignani's Messenger.*

Algerine Harbour.—A naval engineer has been sent to the new French conquest of Stora, to devise means of securing the vessels in the harbour against all danger.

Gas Companies in America.—The New York Gas Light Company has declared a semi-annual dividend of 5 per Cent.—*New York Courier and Enquirer.*

New York Canals.—The tolls received on the New York State Canals from the opening of canal navigation to the 30th of September, were—

	Dollars.
In 1837	833,404
In 1838	1,083,509
Increase of 1838	250,104

or a fraction over 30 per cent.

MISCELLANEA.

Parallax of the Fixed Stars.—This important and valuable problem, which has for so many centuries been an object of inquiry amongst astronomers, has, it appears, by letters received in this country, been solved by Professor Bessell, of Königsberg. His observations were made on the double star, No. 61, in the constellation Cygnus, whose distance he has ascertained to be 660,000 times the radius of the earth's orbit, or 62 trillions and 700 billions miles in round numbers. The details of this discovery will be communicated at an early meeting of the Royal Astronomical Society.

Dublin School of Mining.—We believe it is not generally known that the Royal Dublin Society have a school of mining, of which Mr. Richard Griffiths is one of the professors, and at which regular courses are given.

Coal Mines.—A valuable mine of fine sea coal has been discovered at Glen Crossack, in the Isle of Man, which is now being worked by the Isle of Man Company, with the prospect of a rich harvest.—*Mona Herald.*

Robbery from the Cornerstone.—Two men, named Western and Pearse, were brought before the magistrate, charged with undermining a new house building in Exeter, and nearly destroying it. Western is a foreman, and Pearse a stonemason. There had been several pieces of money deposited in the cornerstone of the house, and the prisoners had dug under the foundation, taken out the stone, and, robbing it of the money, had replaced it, greatly to the injury of the building. The magistrates fined them, under the Wilful Damage Act, 8*l.* and costs, or three months' imprisonment.—*Exeter Post.*

Liverpool promises to give the gentlemen of the long robe full employment during the ensuing session of Parliament. First and foremost, the town-clerk is going to Parliament for bills to amend certain other bills; then the vestry-clerk goes for a bill to rate the dock estate to the relief of the poor; next, the law-clerk to the highway board applies for a bill to extend the powers of another bill relative to the trust; and, to crown the whole, the dock solicitor, in a notice as long as the sea-wall itself, announces that he wants a bill to empower the trustees to erect warehouses on the dock-quays, &c. So that some 20,000*l.* will, in all probability, change hands in applying for and opposing these various bills. Heaven protect the pockets of the people, therefore, say we, for assuredly they will be assailed by many and dexterous hands. The Lancashire and Cheshire squires, taking advantage of the application of the dock solicitor to Parliament for a new bill, announce, through their solicitor, Mr. Wagstaff, of Warrington, that they go for a bill to vest the conservancy of the river Mersey in the hands of commissioners, and to enable the said commissioners to defray the cost of making embankments, &c., out of the rates levied by the corporation and the dock trustees respectively. Well done, Messrs. the Squires; a busy and expensive session you promise to make the next.—*Liverpool Albion.*

Fire-proof Composition.—A trial of this composition took place lately at Manchester, but in one or two places the cement fell off, and the fire took effect on the parts uncovered.—*Manchester Guardian.*

Sir James Anderson's steam-coach is finished, and will start from Buttevant for this city in a fortnight, travelling at fifteen miles an hour.—*Limerick Chronicle.*

Mining and Miners.—The total ignorance of almost everything relating to the sciences of Geology and Mineralogy, and, above all, of Chemistry, in the conductors of mines and their agents, is not only matter of regret, but, it can hardly be doubted, is also the cause of much loss to the adventurers in mines, to the lords of the soil, and to the buyers of the ore. If a spirit of inquiry had existed, which some knowledge of these sciences could not have failed to produce, much cobalt would not have been thrown away upon the heaps of Dolcoath, and some other mines; nor would bismuth in Wheal Sparnon have been mistaken for cobalt; nor would the roads have been mended with copper ore; nor would the ponderous ore which contained silver, in Herland mine, have been left to the chance that discovered its value; nor would many miners, in opposition to the known principles and properties of mineral bodies, believe, even to this day, in the regeneration of metals. While in France and Germany there are national institutions for the education of those intended to conduct the working of mines in the three important branches of science above alluded to, and which are so intimately connected with their occupation, in this country all is left to accident; and the rich gifts which nature has bestowed upon us, are consequently often neglected, or lavishly thrown away. *Geological Transactions.*

Avery's Rotatory Steam-Engine.—This is an American invention, lately introduced into this country. Mr. Hugo Reid, in his Treatise on the Steam-Engine, observes that, "If found available, it will be extremely valuable, from the cheapness of its first construction and the simplicity of its operation." It now appears, from the *Scotsman*, that several have been erected, and are much approved of. Mr. Hepburn, a farmer of East Lothian, has had one applied to his threshing machine, which answers admirably. Several are now constructing for various purposes, and Mr. Ruthven, an engineer, has made the following report of one set up on his own premises:—"It is working two planing machines, two boring apparatus, six turning lathes (one of them boring cast steel bores, four and five feet long, the aperture being about one inch in diameter), two grindstones, a pump drawing water twenty feet from the surface, and forcing it into the boiler, and a tilt hammer, giving upwards of forty strokes per minute—and this is done at an expense of from 12s. to 15s. per week for coals, working sometimes eighteen hours out of twenty-four without stopping.

Carvings in Wood.—Two very curious and very elaborate carvings in walnut-tree wood, of the alto-relief class, have just been brought to this country. They were formerly in the possession of the Emperor Napoleon, whose eagerness to possess the rarest gems of art was much more than commensurate with his respect for *meum* and *tuum*. These carvings are each about five or six feet in length, and about three or four in height or width. One of them represents the victory Constantine over Maxentius. The design is from Julio Romano, and is known to artists. It contains upwards of 200 figures of combatants, horse and foot, mingled and grouped with great pictorial effect, and carved with extraordinary boldness and accuracy; the finish of the armour costume, and minute details, is very delicate. The second tablet is after a design by Rubens; some of the figures after Leonardo da Vinci. The subject is the scriptural battle in which Joshua commanded the sun to stand still. This carving is in higher relief than its companion; it contains fewer figures, and most of them are equestrian. It is full of spirit, and cut with great freedom of hand. These carvings, which certainly surpass anything that is generally to be seen in this country, are by an Italian artist, Simon Cognoulli, and bear date 1761. Upon the downfall of Napoleon they were returned to their original locality, the castle of Salms. They are now in the possession of Mr. Farrar, of Wardour-street, who has just purchased them from the representative of the family to which they belonged, in consequence of the demise of the head of it, and the necessity of a *distributio bonorum* by the laws of Germany.

Enormous Chimney.—The new chimney recently erected at Mr. Muspratt's chemical works has recently been put into operation. It is stated to be the highest chimney in England, measuring no less than 132 yards 1 foot 6 inches from the base to the summit.—*Liverpool Albion.* [This is nearly as high as the great Pyramid.]

Ingenious Invention.—Mr. James Duncan, watchmaker, Glenluce, has lately constructed a small steam-engine on the high pressure principle, the novelty of which consists in the steam acting twice in the cylinder before it escapes into the atmosphere, by which there is a saving of half the fuel and half the water which a common engine of the same power would require.—*Edinburgh Courant.*

Geology.—Mr. Buckland is now making a tour of investigations in Switzerland, and was by the last advices at Chaux de Fond, in Neufchatel.

Geology.—The Archbishop of Bordeaux, has ordered geology and the physical sciences to be taught in all the seminaries of his diocese, and commenced the formation of collections of these objects. [What a contrast this is to the conduct of the *Times*, the leading journal of the age, in denouncing geologists as Atheists!]

March of Steam.—As the year 1838 will most assuredly form a remarkable epoch in the history of steam navigation, it may not be thought uninteresting to trace the advances it has made since the year 1814, when one steam-boat, of 9 tons burden, floated in solitude on the British waters.

The following authentic account of the number and tonnage of steam vessels belonging to the British empire (including the plantations), from 1814 to 1836 inclusive, has been politely supplied to us by the Secretary of the Liverpool Statistical Society:—

Year.	Vessels.	Tonnage.	Year.	Vessels.	Tonnage
1814	2	456	1826	248	28,958
1815	10	1,633	1827	275	32,490
1816	15	2,612	1828	293	32,032
1817	19	3,950	1829	304	32,283
1818	27	6,441	1830	315	33,444
1819	32	6,657	1831	347	37,445
1820	43	7,243	1832	380	41,669
1821	69	10,534	1833	415	45,017
1822	69	13,125	1834	462	50,736
1823	82	14,153	1835	538	60,520
1824	82	15,739	1836	600	67,969
1825	81	20,287			

—*Liverpool Mail.*

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 31st OCTOBER, AND THE 26th NOVEMBER, 1838.

Paul Chappe, of Manchester, Spinner, for "Certain Improvements in the Means of Consuming Smoke, and thereby Economising Fuel and Heat in Steam Engine and other Furnaces and Fire Places."—31st October; 6 months.

Luke Hebert, of Staple's Inn, Civil Engineer, for "Certain Apparatus and Processes for Storing, Cleaning, and Preserving Grains."—3rd November; 6 months.

Abraham Bury, Esq., of Manchester, for "Certain Improvements in the Mode of Printing, Colouring, or Dyeing Cotton and other Fabrics, and in the Mode of producing Certain Acid or Acids applicable to those or other Purposes."—3rd November; 6 months.

Jacob Tilton Slade, of Carburton Street, Gentleman, for "Certain Improvements in Pumps for Liquids or Aeriform Fluids."—3rd November; 6 months.

Joseph Fraser, of Halifax, Railway Contractor, for "Certain Improvements in the Apparatus or Machinery to be employed as Centerings or Supporters in the Construction of Bridges and Arches, and in Tunnels or other Mining Operations."—3rd November; 6 months.

Horace Corey, of Narrow Street, Limehouse, Bachelor of Medicine, for "Improvements in the Manufacture of White Lead."—3rd November; 6 months.

Charles Callis Baron Western, of Rivenhall, Essex, for "An Improvement in Drills for the Purpose of Drilling Corn, Grain, Seeds, Pulse and Manure."—3rd November; 6 months.

William Morgan, of New Cross, Surrey, Gentleman, for "Improvements in the Generation of Steam."—3rd November; 6 months.

Adolphus Henri Erneste Ragon, of Great Portland Street, Professor of Literature, for "Improvements in the Manufacture of Glass, and in the Production of other Vitrified Matters applicable to Architectural Purposes."—3rd November; 6 months.

Edward Cooper, of Piccadilly, for "Improvements in the Manufacture of Paper. Communicated by a Foreigner residing abroad."—3rd November; 6 months.

Charles Flude, of Liverpool, Chemist, for "Improvements in Applying Heat for Generating Steam, and for General Manufacturing and other useful purposes where Heat is required, and also for an Improved Mode of supplying Steam Boilers with Hot Water, the said Improvements having for their object the Economy of Steam."—3rd November; 6 months.

Jerome Deville, of Crutched Friars, Coach Builder, for "Improvements in Rail Roads, and in Carriages used thereon."—3rd November; 6 months.

James Berington, of Charles Place, Shoreditch, Veterinary Surgeon of Cavalry, for "Improvements in Knapsacks."—3rd November; 6 months.

Robert Beart, of Godmanchester, Miller, for "Improvements in Apparatus for Filtering Liquids."—3rd November; 6 months.

William Henry James, late of Birmingham, but now of Lambeth, in the County of Surry, Civil Engineer, for "Improvements in Apparatus for Heating, Generating, and Cooling Fluids, and in Engines to be actuated by such Fluids, Parts of which Improvements are applicable to the Raising and Forcing Fluids."—6th November; 6 months.

Luke Herbert, of Bristol Road, Birmingham, Civil Engineer, for "A New or Improved Process for Embalming the Dead, and for Preserving Corpses for Anatomical Purposes. Communicated by a Foreigner residing abroad."—6th November; 6 months.

Moses Poole, of Lincoln's Inn, Gentleman, for "Improvements in Apparatus or Machinery for obtaining Rotatory Motion. Communicated by a Foreigner residing abroad."—8th November; 6 months.

John Jockes, of Shropshire, Gentleman, for "Improvements in Steam Engine Boilers, and in Apparatus for Feeding Furnaces and Fire Places, and for the more effectual Combustion of the Smoke and Gases arising therefrom."—8th November; 6 months.

Bryan T. Anson Bromwich, of Clifton-on-Tine, Gentleman, for "Improvements in Machinery to be worked by the application of the Expansive Force of Air, or other Elastic Fluids to obtain Motive Power."—8th November; 6 months.

John Small, of Old Jewry, Merchant, for "Improvement in Filtering Liquids. Communicated by a Foreigner residing abroad."—8th November; 6 months.

Henry Huntley Mohun, of the Regent's Park, M.D., for "Improvements in the Composition and Manufacture of Fuel, and in Furnaces for the Consumption of such and other kinds of Fuel."—8th November; 6 months.

Thomas Mayos Woodyatt, of Cookly, Screw Manufacturer; and Samuel Harrison, of Birmingham, for "Improvements in the Manufacture of Wood Screws."—8th November; 2 months.

John Browne, of Castle Street, Oxford Street, Esq., for "Improvements in Paving Roads and Streets."—8th November; 6 months.

Felix Macartan, of St. Martin's Lane, for "Improvement in Treating the Waste Matter resulting from the Washing of Wool, and Woollen Fabrics."—8th November; 6 months.

William Watson, Jun., of Leeds, Manufacturing Chemist, for "Certain Improvements in the Manufacture of Materials used in the Dyeing of Blue and other Colours."—8th November; 6 months.

John Winrow, of Gunthorpe, Nottingham, Mechanic, for "Certain Improved Means of, and Apparatus for, Destroying Weeds and Insects on Land."—8th November; 6 months.

James Drew, of Manchester, Civil Engineer, for "Certain Improvements in the Means of Consuming Smoke, and Economising Fuel, in Steam-Engine or other Furnaces or Fire Places."—8th November; 6 months.

Hugh Ford Bacon, of Fen Drayton, Clerk, for "An Improvement or Improvements in the Construction of the Glass Holders and Glass Chimneys of Gas Burners."—10th November; 6 months.

John Holmes, of St. John's Terrace, Worcester, Engineer, for "Improvements in Forming Moulds for Casting in Metal, Studs, Buttons, Nails, Tacks, and a variety of other articles."—13th November; 6 months.

George Smith, of the Navy Club House, Bond-street, or Captain in the Royal Navy, for "Certain Improvements in Vessels to be propelled by Steam or other Power, and in the Construction and Arrangement of the Machinery for propelling."—13th November; 6 months.

Anne Bird Byerley, of 147, Strand, Widow, and James Collier, of the same place, Civil Engineer, for "Certain Improvements in obtaining Motive Power."—13th November; 6 months.

Sally Thompson, of North-place, Gray's Inn-road, for "Certain Additions to Locks and Fastenings for Doors of Buildings, and for Cabinets, Drawers, Chests, and other Receptacles, for the purpose of affording greater Security against Intrusion by means of keys improperly obtained."—13th November; 6 months.

Edward Samuell, of Liverpool, Merchant, for "Improvements in the Manufacture of Soda."—13 November; 6 months.

Joseph Eden Macdowall, of No 257, High Street, Borough, Watch Maker, for "An Improvement in the Manufacture of Escapements for Chronometers, Clocks, and Watches."—15th November; 6 months.

Thomas Trench Berney, of Morton Hall, Norfolk, Esquire, for "Certain Improvements in Cartridges."—15th November; 6 months.

William Thorp and Thomas Meakin, of Manchester, Silk Manufacturers, for "Certain Improvements in Looms for Weaving, and also a new Description of Fabric to be produced or woven therein."—20th November; 6 months.

William Watson, Jun., of Leeds, Manufacturing Chemist, for "Certain Improvements in the Manufacture of Liquid Ammonia, by which the same may be made applicable to the purposes of Dyeing, Scouring, and other manufacturing processes."—20th November; 6 months.

Harrison Grey Dyar, of Mortimer Street, Cavendish Square, Gentleman, for "Improvements in the Manufacturing of Zinc."—20th November; 6 months.

John Wilson, of Liverpool, Lecturer on Chemistry, for "Certain Improvements in the process of Manufacturing Alkali from Common Salt."—22nd November; 6 months.

Fanquet Delarne, Jun., late of Deville, near Rouen, in the Kingdom of France, but now of Manchester, Calico Printer, for "Certain Improvements in the Process of Printing, or otherwise applying and fixing the colouring matter of Madder upon Cotton, Silk, Linen, and other fabrics without Dyeing, and producing by these means Permanent Colours."—22nd November; 6 months.

John George Bodmer, of Manchester, Engineer, for "Certain Improvements in Machinery-tools, or Apparatus for Cutting, Planing, Turning, Drilling, and Rolling Metals and other Substances."—22nd November; 6 months.

Abraham Cohen, of Islington, Esquire, for "Certain Improvements in the Construction of Railway Carriages, and in the Modes of Connecting and Retarding Railway Trains."—26th November; 6 months.

NOTICES TO CORRESPONDENTS.

In consequence of the present number containing the Index and Contents, we have not had time to examine several communications and books, which we have been obliged to postpone until next month.

We will endeavour to devote, in our future numbers, a larger space for our Architectural friends. We have received several suggestions for increasing the size of the Journal for that purpose; but this we are not disposed to do, as it will entail an additional sixpence on the work; but if we find that we cannot compress all our communications in the present sized number, we will publish quarterly an additional sixteen pages, and charge the sixpence extra.

Subscribers are particularly requested to complete their sets of numbers for the first volume immediately.

We shall feel obliged to the profession if they will forward us accounts of works in progress, new inventions and discoveries; and particularly if our country subscribers will send us any newspaper containing any matter relative to the objects of our Journal.

Books for review must be sent early in the month; communications prior to the 20th; and advertisements before the 26th instant.